

ISSUES IN THE SEMANTICS OF MANDARIN QUESTIONS

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This dissertation strives to explain certain long-standing issues in Mandarin questions within a new framework, i.e. the Alternative Semantics theory, and also to bring in hitherto unnoticed new data.

Part I of the dissertation examines argument wh-questions. Starting from Tsai's (1999) Lexical Courtesy Hypothesis, according to which wh-movement in general should be avoided if possible, I present an analysis of Mandarin wh-in-situ within the framework of Alternative Semantics (Rooth 1985, Shimoyama 2001) which does not resort to LF movement or unselective binding. Furthermore I propose that the scope marking of questions in this theory is achieved by focus intonation.

Experimental phonetic data are provided to support this important new claim. I also apply this new theory to polarity, A-not-A and alternative questions in Mandarin, showing that they are formed by syntactic specification of a set of alternatives on different levels respectively. The Alternative Semantics analysis is further extended to wh-existential and wh-universal constructions. I show that existential closure can be applied either locally or non-locally as a consequence of the compositional semantics in the wh-existential constructions. In the universal construction “*mei...dou*” (“every...all”), the long-standing problem of double-distributivity is accounted for by universal concord in the sense of Kratzer (2006)

Part II examines “how” and “why” questions using event semantics. Data from Mandarin show that there is an event singularity presupposition in manner “how” and causal “why” questions, and this presupposition leads to a singleton set when the

true answers are considered. This explains such cross-linguistic puzzles as the distribution of the exhaustivity marker “all” in wh-questions and the lack of quantificational variability effect in embedded manner and causal questions. I also propose an analysis of verbal “how” questions in Mandarin (e.g. Yuehan zenme-le Mali? literally “John how-ed Mary?”). The verbal “how” is treated as a ditransitive verbal variable in the lexicon, and it can account for the three special constraints on the use of such verbal “how” questions, i.e. the malefactivity reading, incompatibility with negation, and lack of a ditransitive use.

I also propose a new typology of wh-questions based on the parameters of the interpretational variability of wh-pronouns and scope marking strategies.

BIOGRAPHICAL SKETCH

Hongyuan Dong is from the Hohhot City in the Inner Mongolian Autonomous Region of China. He went to elementary school, middle school and high school in the city. In 1995, he was admitted to Nankai University in Tianjin, China where he became interested in linguistics, especially the history of the Chinese language. Thus he decided to pursue an academic career in Chinese linguistics. After obtaining a BA in English from the Department of English, Nankai University in 1999, Hongyuan went to Peking University in Beijing, China to study Chinese linguistics and philology in the Department of Chinese Language and Literature, where he had the honor to take classes taught by world-renowned Chinese linguists. He earned an MA in Chinese Linguistics and Philology from Peking University in 2002, and then came to Cornell University to further his studies in general linguistics. Hongyuan quickly discovered the beauty of formal semantics and decided to concentrate on the semantic issues of Mandarin questions. This dissertation is a reflection of his research in this area of linguistics in the past seven years at Cornell University.

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LIST OF ABBREVIATIONS

Acc	accusative
BA	in BA constructions, the NP after BA is the object of the verb
BEI	in a passive construction in Mandarin it introduces the agent
CL	classifier
Dat	dative
DE	Mandarin <i>de</i> used in relative and resultative clauses
EXP	experiential aspect
KA	particle –ka in Japanese
Loc	locative
MO	particle –mo in Japanese
Nom	nominative
PAR	sentential particle in Mandarin
PRF	perfective aspect
Q	question particle
Top	topic marker

LIST OF SYMBOLS

\subseteq	subset
\in	is an element of
\cap	intersection
\cup	union
\neq	not equal
\wedge	logical “and”
\vee	logical “or”
\neg	negation
\rightarrow	conditional
\leftrightarrow	biconditional
$\alpha \ \beta \ \gamma$	category variables
$\phi \ \varphi$	propositional variables
\forall	universal quantifier
\exists	existential quantifier
λ	lambda operator
\Box	necessity operator
\Diamond	possibility operator
$\llbracket \cdot \rrbracket^{w,g}$	the interpretation function with respect to w and under the assignment g

PREFACE

Words exist because of meaning. Once you've gotten the meaning, you can forget the words. Where can I find a man who has forgotten words so I can talk with him?

—Chuang Tzu

For me, meaning is the ultimate goal of language. People who speak different languages can express the same meaning. Does this tell us that to some extent form is more of a tool to get to meaning, rather than a goal *per se*, or at least so in most cases? This is exactly why I am so fascinated by semantic issues in language, especially in Mandarin. Important as meaning is to language, the path from form to meaning is the central topic in my studies. What is the architecture of the syntax that is used to convey the desired meaning? How is this architecture related to the semantic objects in a systematic way? What other aspects of language also contribute to meaning in place of syntax? During my research on the topic of Mandarin questions, I realized that a better understanding and characterization of the meaning of questions can be achieved only when we take the interaction between syntax, phonology/phonetics and semantics into consideration. Thus this dissertation reflects my efforts in the study of syntax-semantics and phonology-semantics interface issues, with a view towards the ultimate goal of meaning so that words can be forgotten.

CHAPTER 1

INTRODUCTION

The central topic of this dissertation is the interpretations of questions and related wh-constructions in Mandarin. Although the question about questions has been very popular in formal linguistics for a few decades, I think new contributions can be made in at least two different ways. First, a new theory would shed light on old data. More recently, the Alternative Semantics originally proposed by Rooth (1985) for the interpretation of focus has been extended to the interpretation of wh-questions in languages that have wh-indefinites (e.g. Shimoyama 2001). This theory has been further developed into a general theory of indefinite NPs (e.g. Kratzer 2006), comparable to the theories of unselective binding and dynamic semantics that have been popular for the interpretation of indefinite NPs. The Alternative Semantics has been used to account for the indeterminate wh-phrases in Japanese (Shimoyama 2001, 2006). Actually there are many similarities in this respect between the wh-indefinites in Mandarin and the wh-indeterminates in Japanese. Thus it is worthwhile to examine Mandarin data using this new theory to see what new insight can be gained based on old data, what new data would be discovered in light of the new theory, or what theoretical contributions Mandarin data can make. Second, there are always interesting phenomena that have been ignored even in very popular areas of studies. I try to bring a series of phenomena in Mandarin that has not been paid much attention to before. For example, the phonological properties used to mark wh-question scope and to distinguish between the interrogative readings and the existential readings of wh-indefinites. Also for example, adjunct-type wh-questions like manner “how” questions and a special type of verbal “how” questions in Mandarin. These are very interesting topics, both theoretically and empirically. Therefore this current dissertation is

devoted to the issues in the semantics of Mandarin questions and wh-constructions. In the remainder of this introductory chapter, I will give a general overview of the different chapters in Section 1.1. Then in Section 1.2, I will discuss the two major theories of the denotation of questions, because they are relevant throughout the dissertation and it is better to put them in the front so that reference can be made readily if needed.

1.1 Overview

This dissertation comprises two parts. Part I includes chapters 2, 3, and 4. These are mainly on wh-arguments within the framework of the Alternative Semantics theory. Part II includes chapters 5, 6, and 7. They are about non-argument wh-questions, with a combination of event semantics and the general approach to the semantics of questions.

In Chapter 2, I compare three different theories of wh-questions with the guiding principle of Economy, or the Lexical Courtesy Hypothesis (Tsai 1999). The first theory is the Quantificational theory. This is the theory behind the LF analysis of wh-in-situ. The second theory is the Unselective Binding theory, which resorts to a Q morpheme to interpret wh-variables in situ. The third theory is the Alternative Semantics. I will show that the Alternative Semantics theory is both theoretically and empirically more straightforward and it has certain advantages over the other two theories. One of the advantages is that it gives the simplest parallel derivation between syntax and semantics. Another advantage is that it links the different interpretive possibilities of wh-indefinites together. I also argue against Cheng's (1991) Clausal Typing Hypothesis. First I show evidence that there is no question particle in Mandarin. This is indeed what the Alternative Semantics prefers, since the semantic mechanism in that theory makes the wh-binder redundant. Then I point out that the

question particle in Japanese wh-questions might be scope markers, instead of wh-binders. I also provide new data on the focus intonation of wh-questions in Mandarin, and propose that the scope of the focus marks the scope of the question. Finally, based upon my discussion of the interpretation of questions in Mandarin, I propose a new typology of languages based upon the combination of two parameters. The first parameter is the interpretive variability. Wh-pronouns in a language can be either a quantifier or contribute a set of alternatives. The second parameter is the scope marking parameter. A language may use one of these three strategies: movement, focus intonation, and question particles.

In Chapter 3, I extend the Alternative Semantics to existential readings of wh-indefinites in Mandarin. First I propose to classify Lin's (1996) three groups of licensing environment for these existential wh-phrases into two categories: modal vs. non-modal. Then I argue that the way existential closure is applied in these two types of licensing environments is different. In modal environments, existential closure is applied on the sentential level, and the licenser checks the focus feature on the wh-pronoun. In non-modal environments, existential closure is applied locally and the existential quantifier checks the focus feature on the wh-pronoun. These can be formulized into a set of conditions. The idea is that existential closure should be applied as late as possible. Furthermore, I explore the possibility of scope interactions between these wh-existential and other quantifiers. I point out that if the scope relation does not lead to semantic anomaly then it is allowed freely. If a certain scope relation would lead to the wrong interpretation according to the Alternative Semantics, then it is not allowed. This is the case with existential wh-constructions that contain a universal quantifier. I argue that the wide scope reading for existential wh-pronouns is ruled out by the general fixed scope relations in Mandarin and also by semantic

interpretation problems. Thus the wide scope reading for the existential wh-pronouns should be regarded as a special case of the narrow scope reading.

Chapter 4 further explores the applicability of the Alternative Semantics to the universal interpretations of wh-indefinites in Mandarin. There are two different universal constructions in Mandarin, i.e. the *mei...dou* construction and the *wh...dou* construction. One of the problems with the *mei...dou* construction is the co-occurrence requirement. I argue that this construction is actually a case of universal concord, in the sense of Kratzer (2006). If we take this view, then all of the properties of the *mei...dou* construction can be readily explained, e.g. the leftness condition, and the clause-mate condition. On the other hand, in the *wh...dou* construction, there is also a leftness condition which requires the movement of the wh-phrase. I explain this in terms of a feature checking requirement, similar to the *mei...dou* construction. To compare these two universal constructions, I point out that the domain of quantification of the *wh...dou* construction is wider than the *mei...dou* construction. This is due to the uninterpretable quantificational feature carried by the *mei*-phrase, while wh-indefinites lack any quantificational force. The discussion in this chapter not only provides evidence for the existence of universal concord, but also gives a new solution to a long-standing problem in the study of the universal construction in Mandarin, i.e. the semantic conflict between *mei* and *dou*.

In Chapter 5, I study the denotational semantics of manner “how” questions, using data from both Mandarin and other languages. First I give a semantic representation of such questions along the lines of Hamblin (1973) and Karttunen (1977). I argue that “how” ranges over sets of properties of events. To derive the true answer set from the Hamblin-set of possible answers, the presupposition carried by manner questions would yield a singleton set of only one true proposition. I give evidence from English and Mandarin to show that indeed manner questions

presuppose one and only one topic event. Then I apply the semantics of manner “how” questions to explain three phenomena with regard to the use of these questions. The first phenomenon is the incompatibility of the exhaustivity marker “all” with such manner “how” questions. I argue that this is because of a conflict between the event singularity presupposition and the plurality presupposition of “all”. The second phenomenon is the problem of choice functions with adjunct wh-phrases. Since manner “how” ranges over sets of properties of events, they can not be interpreted via a choice function, which should take a set of individual entities as its argument. Thirdly, I explain the lack of quantificational variability in embedded manner “how” questions in terms of the event singularity presupposition as well. Since there is only one true proposition in the denotation of the question, there is no room for quantificational variability.

In Chapter 6, I discuss a special type of verbal “how” questions in Mandarin. First I extend my analysis of the manner “how” questions within the framework of event semantics to such verbal “how” questions. I show that such verbal “how” questions have quantification over properties of events, and in comparison to manner “how” questions, there is no event singularity presupposition in these verbal “how” questions. Next I propose a compositional semantics for such verbal “how” questions. I base my proposal upon an idea used by Abusch (1994) to derive the semantics of wide-scope indefinite NPs by using structured variables. Then by combining this mechanism with Kratzer’s (1996) compositional event semantics, I show how to derive the verbal “how” questions compositionally. I explain three special constraints on the use of such verbal “how” questions. The first one is that they cannot be used as a negated question. This is explained in terms of the interaction between the existential closure on the event argument and the negation operator. The second one is that in the one-place verb uses of this “how”, the subject seems to be the deep-structure object.

The third constraint is that this verbal “how” cannot be used in a ditransitive construction. To address these two problems, I propose that the lexical semantics of this verbal “how” is a variable that ranges over predicates that correspond to a transitive verb. Therefore the second constraint with respect to the subject of an intransitive use of “how” can be explained in terms of a passive construction, and the incompatibility of this “how” with ditransitive constructions is just obvious since the lexical semantics of this “how” does not allow it to be used as a ditransitive verb.

In Chapter 7, I will explore some properties of “why” questions. These are the most different questions. Therefore my discussion is only tentative. First I will extend my analysis of manner “how” questions to “why” questions, and show that the denotational representation of “why” questions is essentially the same as “how” questions, and this explains the same set of phenomena as encountered in Chapter 5, i.e. the incompatibility with the exhaustivity marker “all”, and the lack of quantificational variability in embedded positions. I will also point out the focus sensitivity of “why” questions in Mandarin. But I will not give a full explanation to it. Therefore this chapter is still experimental and it will propose topics for future research.

Then I make my general conclusions in Chapter 8.

1.2 The Semantics of Questions, in General

In this section, I will introduce the two major theories of questions. The problem with the semantics of questions is that they are not truth-conditional. We cannot say of a question whether it is true or false. Thus there are two possible ways of defining the denotation of questions. One possibility is to relate the semantics of questions to the truth-conditional semantics of propositions. The other possibility is to find a rather different denotation for questions. Correspondingly, there are two major

theories of the semantics of questions: the proposition set approach, and the partition approach.

Hamblin (1958, 1973) argued that the semantic value of a question is a set of its corresponding possible answers. For example:

- (1) Who went to the party?
- (2) { that Adam went to the party;
that Bill went to the party;
that Chris went to the party;
that Dan went to the party }
- (3) $\lambda p \exists x [\text{person}'(w)(x) \wedge p = \lambda w'. \text{party}'(w')(x)]$

The question in (1) denotes a set of propositions which are possible answers to that same question. Suppose there are four individuals in the domain of discourse, and they are Adam, Bill, Chris, and Dan. The possible answers would be those in (2). The set of propositions can also be written as (3). I use “party” as a shorthand notation for the predicate “went to the party” in (1). The free world variable w in $\text{person}'(w)(x)$ is the contextually salient world, which is usually the actual world.

Karttunen (1977) modifies Hamblin’s proposal, and argues that denotations of questions contain only true answers. For example in (1) if in the actual world only Adam and Dan went to the party, then the denotation of (1) only includes the two propositions of “Adam went to the party” and “Dan went to the party”.

Correspondingly, the formula in (3) can be revised as (4):

- (4) $\lambda p \exists x [p(w) \wedge \text{person}'(w)(x) \wedge p = \lambda w'. \text{party}'(w')(x)]$

The new conjunct $p(w)$ filters out the false answers. It guarantees that only those propositions that are true in the world w are in the set.

The usefulness of Karttunen's true answer set is that in certain embedded questions, it is needed to derive the correct reading. For example, if a question is embedded under the factive verb "know", then in one of the readings, i.e. the weakly exhaustive reading in Groenendijk and Stokhof's (1984) term, "to know Q " means to know the set of true answers to Q . This is when Karttunen's semantics is preferred.

Now let's look at the other theory. Intuitively, a person who asks a question wants to be relieved from a state of ignorance with respect to a certain piece of fact about the world, and they want to differentiate between all the possibilities and try to figure out which one is real. In accordance with this line of thinking, Groenendijk and Stokhof (1984, 1989) develop the partition semantics of questions. In their theory, the meaning of a question is a partition on the set of possible worlds, or put in a different way, an equivalence relation on the set of possible worlds. A question divides the set of possible worlds into subsets of worlds where the answers to the question are the same. For example, the denotation of (1) would be (5):

$$(5) \lambda w. \lambda w'. [\lambda x. \text{party}'(w)(x) = \lambda x. \text{party}'(w')(x)]$$

When we apply the formula in (5) to any two worlds w and w' , the two worlds are equivalent with respect to the property of going to a party, if for each individual x that went to the party in w , x went to the party in w' , and for each individual x that did not go to the party in w , x did not go to the party in w' . In this way the set of possible worlds can be partitioned into different cells. For example, the questions in (1) would correspond to a partition with 16 cells when there are four individuals in the domain of discourse, as shown in Table 1.1.

Table 1.1: An example of partition semantics

No one went to the party
Adam went to the party
Bill went to the party
Chris went to the party
Dan went to the party
Adam and Bill went to the party
Adam and Chris went to the party
Adam and Dan went to the party
Bill and Chris went to the party
Bill and Dan went to the party
Chris and Dan went to the party
Adam and Bill and Chris went to the party
Adam and Bill and Dan went to the party
Adam and Chris and Dan went to the party
Bill and Chris and Dan went to the party
Adam, Bill, Chris and Dan went to the party

The whole table represents the set of possible worlds, and each of the cells is a subset of these possible worlds, representing one of the possibilities or states of affairs among which a person who asks a question wants to differentiate.

This concludes a simple introduction to the topics studied in this dissertation and the two major theories of questions.

CHAPTER 2

THREE SEMANTICS OF MANDARIN QUESTIONS

In this chapter, I will compare three different theories of questions: the Quantificational theory (Huang 1982a, b), the Unselective Binding theory (Cheng 1991, Tsai 1999) and the Alternative Semantics theory (Shimoyama 2001 and 2006, Kratzer 2006). My discussion is based upon two influential theories of Mandarin wh-questions, i.e. Tsai's (1999) Lexical Courtesy Hypothesis and Cheng's (1991) Clausal Typing Hypothesis. First, I will show that the Lexical Courtesy Hypothesis favors a more economical theory of wh-in-situ and this is achieved in the new Alternative Semantics theory. On the other hand, the Alternative Semantics theory predicts that question particles are not semantically necessary. I argue that the particle *-ne* is not a question particle at all, which leads to the rejection of the Clausal Typing Hypothesis. Second, I provide new data on the focus intonation of wh-phrases in Mandarin in light of recent cross-linguistic research on the focus of wh-phrases in many different languages. Based upon the focus properties of wh-phrases, I argue that the scope of wh-phrases in Mandarin questions is marked by their phonological prominence and such phonological properties of wh-pronouns reflect different derivation histories. I also give phonetic evidence based upon an experiment carried out specifically to test the claim of phonological prominence as a scope marking strategy. Thirdly, I discuss some typological implications of my proposals in light of Bruening's (2004) typological investigations on wh-indefinites.

The structure of this chapter is as follows. In section 2.1, I introduce the basic data regarding Mandarin questions, and point out major issues to be solved. Then in section 2.2 I discuss the Quantificational theory of questions and its problems. Section 2.3 deals with the Unselective Binding theory, and I argue that such a theory is

empirically problematic for explicating the Mandarin data. In section 2.4, I will introduce the Alternative Semantics theory and propose a new syntactic representation of Mandarin wh-questions, and show how a better theory of questions can be obtained. In section 2.5, discussions will be extended to other types of questions in Mandarin, including polarity questions, alternative questions, and A-not-A questions. Section 2.6 deals with the scope marking strategy of wh-questions. It will be shown that focus accent is used to mark the scope of a question in Mandarin. Section 2.7 shows evidence from experimental phonetics for the scope marking strategy in Mandarin questions. In section 2.8, I will make some comments about the typological implications of my proposals. In section 2.9 I will summarize my proposals in a more systematic way and touch upon further issues.

2.1 Mandarin Wh-Questions

There are four major types of questions in Mandarin: wh-questions, polarity questions, alternative questions and A-not-A questions. I start with wh-questions in this section and extend my analysis to the other three types of questions in Section 2.5.

Mandarin is a wh-in-situ language. A simple comparison between a Mandarin wh-question and an English wh-question shows that there is no overt movement of wh-phrases in Mandarin. For example:

(1) Yuehan xihuan shei? (Mandarin)

John like who

Who does John like?

(2) Yuehan xihuan Mali.

John like Mary

John likes Mary.

(3) Who does John like? (English)

(4) Whom did John see?

The wh-pronoun *shei* in (1) is in its usual object position, which is post-verbal as shown in (2). In the corresponding English question (3), the wh-pronoun *who* has moved from the object position to the front of the sentence. The movement can be seen even more clearly in (4), where the fronted wh-pronoun *whom* is still in the accusative case. This contrast is not only true in root questions but also true in embedded questions, as is shown in (5) and (6).

(5) Bi'er zhidao Yuehan xihuan shei.¹ (Mandarin)

Bill know John like who

Bill knows who John likes.

(6) Bill knows who John likes. (English)

In Mandarin, a wh-question can be embedded directly under the verb *zhidao*, as shown in (5). In contrast to the Mandarin question, in the English example (6), the wh-pronoun *who* is still in the fronted position within the embedded wh-question. Therefore such data simply show that Mandarin wh-phrases stay *in situ* in normal wh-questions.

Before moving on to the next step, I want to point out that it is possible for a wh-phrase in a Mandarin question to move syntactically in a way similar to English wh-phrases. For example:

¹ Some linguists, e.g. Huang (1982a), claim that embedded question such as (5) is ambiguous between an embedded scope reading and a matrix scope reading. I will show in section 2.6 that actually such questions are not ambiguous in the way as Huang (1982a) describes, if we take the phonological properties of such sentences into consideration.

(7) *Shei*, Yuehan xihuan?

Who John like

Who does John like?

In (7), the wh-pronoun *shei* is moved overtly from the object position to the front of the sentence. The surface word order is very similar to an English wh-question, such as (3). However, this does not mean that wh-movement is optional in Mandarin.

Actually the sentence in (7) is an example of topicalization. First, there has to be a pause after the fronted wh-pronoun. This pause is indicated by the comma following the wh-pronoun. Second, the fronting of the wh-pronoun normally has a contrastive meaning. The question in (7) presupposes that there are some people that John likes and there are some people that John does not like. Thus this kind of movement has nothing to do with the question meaning. It can be argued that (7) is the result of topicalizing the wh-phrase in a wh-question that has already been formed. The main theme of my current research is about the interpretation of questions. Therefore I will not deal with topicalization of wh-phrases in Mandarin. For research on the topicalization of wh-phrases in Mandarin, please refer to Wu (1999).

The data of Mandarin wh-in-situ and the contrast between the Mandarin-type languages and the English-type languages pose the following questions. First, is there any real variation between these two types of languages in terms of wh-movement? Second, is the observed difference fundamental or just superficial? Third, if the difference is real, what is the source for such a difference? Finally, what should an adequate theory of questions be?

In this chapter I will try to answer these questions. In the next three sections, I will compare three different theories of questions: the Quantificational theory (Huang

1982a, b), the Unselective Binding theory (Cheng 1991, Tsai 1999) and the Alternative Semantics theory (Shimoyama 2001 and 2006, Kratzer 2006).

A successful theory of questions should have at least two interconnected components. First, we need a syntactic component about the derivation and configuration of interrogative sentences. Second, there should be a compositional semantics that corresponds to the syntactic component. Sometimes a syntactic theory of questions can get support from the corresponding semantic theory, while it is also possible for a semantic theory of questions to be favored over other semantic theories in light of the corresponding syntactic theory. This interconnectedness of the two components in a theory of questions is the guideline of my comparison of the three theories. In most previous research on wh-questions in Mandarin, linguists only focus on either syntax or semantics, with minimum help from the other field. Therefore in my current research I will look at the combination of the syntactic and the semantic components and see which one is more adequate for the Mandarin-type wh-questions. By “syntactic structure” or “syntax”, I refer to the level of derivation equivalent to the LF assumed in most syntax-semantics interface studies. Since the Quantificational theory is the first theory that has ever been applied to the Mandarin data and also this theory is the most developed both syntactically and semantically among these three theories, I’ll start by discussing the Quantificational theory in section 2.2.

2.2 The Quantificational Theory

Take the following English wh-question for example:

(8) Who went to the party?

(9) [_{CP} who_[+wh] C_[+Q] [_{IP} t went to the party]]

One of the most popular analyses of such wh-questions holds that the syntactic configuration of sentence (8) is (9), in which the wh-pronoun has been merged to the spec position of the interrogative C. The motivation for this movement is feature checking. The interrogative C carries a question feature [+Q]; the wh-pronoun carries a [+wh] feature. The feature on the wh-pronoun needs to be deleted through a checking process with the feature on the interrogative C. This kind of syntax for the English-type wh-questions is a widely-accepted view (e.g. Chomsky 1998, Simpson 2000). Haida (2008) gives a survey of the syntax of wh-movement.

Now the next step is to give the syntactic representation in (9) a semantic interpretation. There is independent work on the semantics of wh-questions which can be applied directly to the syntactic structure in (9). Lahiri (2002), drawing on previous work on the semantics of questions such as Karttunen (1977), proposes a compositional semantics for wh-questions. If we use the Hamblin semantics for questions, the task is to derive a set of propositions which are possible answers to the question. Thus the function of the interrogative C is to turn a proposition into a set of propositions. The semantics of the interrogative C, according to Lahiri (2002) can be formulated as in (10):

$$(10) \llbracket C \rrbracket = \lambda p \lambda q [q = p]$$

According to this formula, the C is a function that takes a proposition and returns a set of propositions. The function of the wh-pronoun is to take a question denotation and existentially close the free variable, which is the semantic value of the trace of the wh-pronoun. Thus the semantics of the wh-pronoun *who* can be formulated as (11):

$$(11) \llbracket who \rrbracket = \lambda Q \lambda p \exists x [person'(w)(x) \wedge Q(x)(p)]$$

The symbol Q is a variable which corresponds to the semantic content of the CP minus the wh-phrase. Notice that in (11), besides the existential closure, the wh-pronoun also supplies the domain restriction to the variable by adding a separate conjunct. A sample derivation can be shown in Figure 2.1 and Table 2.1, which are based on Lahiri’s (2002) illustration. To make things simpler, I will not further analyze the predicate “went-to-the-party” and just represent it with the translation “ $\text{party}'(w)(x)$ ”.

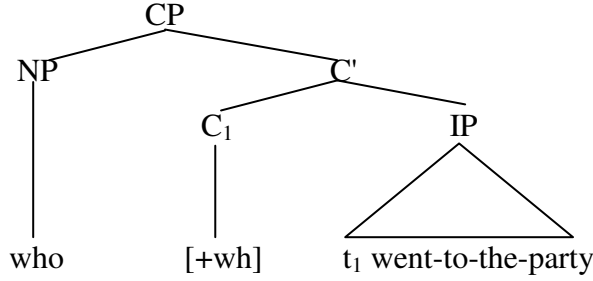


Figure 2.1: Tree structure of a wh-question

Table 2.1: Compositional semantics of the wh-question in Figure 2.1

Node	Translation	Annotation
IP	$\text{party}'(w)(x_1)$	Lexical semantics and functional application
C_1	$\lambda p \lambda q [q = p]$	Meaning of interrogative C
C'	$\lambda x_1 \lambda q [q = \lambda w. \text{party}'(w)(x_1)]^2$	Functional application and lambda abstraction
NP	$\lambda Q \lambda p \exists x [\text{person}'(w)(x) \wedge Q(x)(p)]$	Meaning of “who”
CP	$\lambda p \exists x [\text{person}'(w)(x) \wedge q = \lambda w'. \text{party}'(w')(x)]$	Function application

² This step is probably highly simplified. In the compositional semantics of Heim and Kratzer (1998), the index 1 should be stranded above the C after the wh-movement. Then lambda abstraction applies at the stranded index. Also in this step the world variable w gets bound by a lambda operator as well.

In the semantics sketched above, the wh-pronoun *who* is a function that takes the semantic object of type $\langle e, \langle \langle s, t \rangle, t \rangle \rangle$ which corresponds to the C' and returns a question of type $\langle \langle s, t \rangle, t \rangle$, while the trace of the wh-pronoun is simply of type e . The domain restriction is supplied by the wh-pronoun. Thus the semantic interpretation of wh-questions resembles that of quantifiers. For example:

(12) John loves everyone.

Normally the object of the verb should be of type e . But “everyone” is not of type e . Therefore to solve this type mismatch problem, “everyone” needs to be raised. Thus in (12), according to the Quantifier Raising analysis, the generalized quantifier “everyone” adjoins to IP at LF. The LF form looks like the following.

(13) [_{IP} everyone [_{IP} John love t]]

The generalized quantifier takes a one-place predicate as its direct argument. The domain restriction is also supplied by the generalized quantifier. One more resemblance between generalized quantifiers and wh-phrases is that their scopes are both marked syntactically, either at surface syntax or at LF.

In light of the close resemblance between wh-questions and quantified sentences, I will call this theory of wh-questions the Quantificational theory. Obviously the Quantificational theory offers a neat explanation of the English-type wh-questions. The syntactic component corresponds to the semantic component. There are some other issues with the semantic component such as deriving the *de re/de dicto* distinction. But the general approach is theoretically very appealing, and modifications can be added to account for further issues.

Now let us take a look at Mandarin wh-questions. Since Huang's (1982a, b) work on the LF movement of wh-phrases in Mandarin, the theory of LF movement has been one of the most influential theories in the syntax of Mandarin wh-questions. If the syntactic representation of Mandarin wh-questions is the same as that of English wh-questions, then the Quantificational theory of wh-questions can be directly applied to Mandarin data, and nothing else is needed. Therefore the only task is to establish that there is indeed LF movement of wh-phrases in Mandarin.

One of the arguments used by the LF movement theorists is that embedded wh-questions can have a matrix scope. The key examples from Huang (1982a, 1982b) are quoted here as (14), (15) and (16).

(14) [Zhangsan wen wo [shei mai-le shu]]

Zhangsan ask me who bought books

Zhangsan asked me who bought books.

(15) [Zhangsan xiangxin [shei mai-le shu]]

Zhangsan believe who bought books

Who does Zhangsan believe bought books?

(16) [Zhangsan zhidao [shei mai-le shu]]

Zhangsan know who bought books

a. Who does Zhangsan know bought books?

b. Zhangsan knows who bought books.

The verbs in these examples represent three different categories of verbs. Verbs like *wen* “ask” in (14) take questions as their arguments. Such verbs do not take a propositional argument. We can say that these verbs have a wh-feature, i.e. marked with [+wh], indicating what kind of complements they take. Verbs like *xiangxin*

“believe” in (15) only take a propositional argument. They are marked with [-wh]. Verbs like *zhidao* “know” in (16) can take either a question or a proposition as argument. Such verbs are [\pm wh] verbs. Correspondingly, the embedded question in (14) can only have the embedded reading, because the [+wh] feature of the verb requires that the embedded C carry a [+Q] feature; the whole sentence in (15) has to be interpreted as a question, since the main verb does not take a question as its direct argument, and the embedded wh-pronoun has to check its [+wh] feature with a matrix interrogative C; the sentence in (16) is structurally ambiguous between the embedded question reading and the matrix question reading, since it is possible for the embedded C to be either interrogative or propositional. Huang (1982a) notices the similarities between these examples and quantifier raising. He proposes the following LF representations and interpretations for the examples (14), (15) and (16) respectively.

- (17) [Zhangsan wen wo [shei_x [x mai-le shu]]] (LF of (14))
 Zhangsan ask me bought books
 Zhangsan asked me for which x, x bought books.
- (18) [shei_x [Zhangsan xiangxin [x mai-le shu]]] (LF of (15))
 Who Zhangsan believe bought books
 For which x, Zhangsan believes x bought books.
- (19) [Zhangsan zhidao [shei_x [x mai-le shu]]] (LF of (16)a)
 Zhangsan know who bought books
 Zhangsan knows for which x, x bought books.
- (20) [shei_x [Zhangsan zhidao [x mai-le shu]]] (LF of (16)b)
 Who Zhangsan know bought books
 For which x, Zhangsan knows x bought books.

The reason for assuming these LF representations is:

“Given that facts in UG should be treated in a uniform way for all languages and that there is already a natural representation given by the surface form of overt WH-moved languages, it is entirely reasonable to postulate the abstract representation like (7)-(9)³ for a language without overt movement.”

Huang (1982a: 372)

There are two points made in the quote above. First, LF movement is more desirable for a theory of UG. Second, no new representation needs to be invented if we assume LF movement. I will argue that both of these two points are questionable.

First, theoretically speaking, UG does not necessarily require that certain aspects of language “be treated in a uniform way for all languages”. The problem of LF movement is especially clear in the Minimalist Program (Chomsky 1993). The principle of Economy precludes the possibility of LF movement, if it is indeed avoidable. Tsai (1999) proposes the following hypothesis based upon the principle of Economy.

(21) Lexical Courtesy Hypothesis (LCH) (Tsai 1999: 4)

If a language may introduce an operator by Merger, it will not resort to Chain formation.

According to the LCH, LF movement is a case of Chain formation, and it increases the “length” of a formal object, and is therefore more “costly”. Both in a theoretical sense

³ i.e. (17)-(20) in the numberings in this section.

and in an intuitive sense, LF movement is less desirable, and “‘moving nothing’ is certainly a minimalist goal to achieve” (Tsai 1999: 4).

Second, one of Huang’s (1982a) concerns is the interpretation theory of *wh-in-situ*. If the *wh*-phrases do not move at LF, the semantic interpretation sketched in Figure 2.1 and Table 2.1 will not be applicable to *wh*-questions in Mandarin. Then what structure or elements in the sentences containing a *wh-in-situ* tell us that they are interrogative sentences and how are these interrogative sentences interpreted as questions semantically? Therefore without a proper semantics for *wh-in-situ* as it is, it is still better to assume LF movement. I will show in section 2.4 that the Alternative Semantics is exactly what is needed to interpret Mandarin *wh-in-situ*.

Another concern of Huang’s (1982a) is the scope marking of the *wh*-phrases. In the English-type *wh*-questions, the scope of a *wh*-phrase is marked syntactically. Thus it is reasonable to expect the same from *wh-in-situ*, because if the *wh*-phrases in Mandarin do not move at LF, we will have to explain how the different scopes attested in examples (14)-(16) are marked. I will show in section 2.6 that scope marking of questions in Mandarin is achieved by focus accent. Thus no LF movement is necessary for concerns of scope marking either.

There is another problem for the LF movement analysis. The kind of covert movement in (17) is a violation of the Extension Condition (Chomsky 1993), which requires that an extension of a structure K to K^* should include K as a proper part. Generally, in a derivational approach, all structures are built bottom-up by merger. Thus sentence (14) is built by applying Merger. If there is LF movement, as shown in (17) where the *wh*-pronoun is internally moved to the specifier position of the embedded C , the new structure of (17) does not include the original structure of (14) as a proper part.

Moreover, although the arguments for LF movement illustrated above can indeed show that for interpretation purposes, the embedded wh-pronouns should move at LF, yet for a matrix question like (1), the argument in terms of the properties of the embedding verbs does not apply directly, unless we want to assume that all matrix questions are embedded under a covert [+wh] verb. Thus even if there is LF movement in embedded wh-questions, the argument of LF movement in matrix questions is less convincing.

Thus I will conclude this section by saying that despite the theoretical advantages of the Quantificational theory of Mandarin wh-questions, it still has many problems both theoretically and empirically. The development in semantic theories and the discovery of new data will bring about new theories of wh-questions, and in the next section, I will turn to one of such new theories: the Unselective Binding theory.

2.3 The Unselective Binding Theory

The Unselective Binding theory for Mandarin wh-questions has been proposed in various forms by Aoun and Li (1993a, b), Shi (1994) and Tsai (1999), and Cheng (1991) in some sense. I will base my discussion on the Unselective Binding approach proposed by Tsai (1999).

According to Tsai (1999), there are two ways of constructing an operator-variable pair under the minimalist approach. In terms of wh-questions, the following two strategies are possible:

$$(22) [X'' \Delta [X' \dots \text{wh} \dots]] \rightarrow [X'' \text{Op}_{[Q]} [X' \dots \text{wh} \dots]] \rightarrow [X'' \text{Op}_{i[Q]} [X' \dots \text{wh}(i) \dots]]$$

$$(23) [X'' \Delta [X' \dots \text{wh} \dots]] \rightarrow [X'' \text{wh}_i [X' \dots t_i \dots]]$$

In (22), an operator is merged at the empty position Δ external to the structure. The operator is then indexed with all wh-variables *in situ*. In (23) a chain is formed by moving the wh into the empty position Δ . In English, the second strategy is used because English wh-variables are bound word-internally by the wh-operator⁴, and thus they are not allowed to be bound by an external operator. In Mandarin, the second strategy is used because Mandarin wh-pronouns lack any quantificational force, and they can be bound by various operators to yield various readings such as the universal reading, the existential reading, and the question reading in the case of a wh-operator.⁵ Thus the syntactic structure of the wh-question in (1), repeated here as (24), can be represented as (25).

(24) Yuehan xihuan shei?

John like who

Who does John like?

(25) [_{CP} Op_{I[Q]} C [_{IP} Yuehan xihuan shei_I]]

Now the next step is to give a semantic interpretation to the syntactic representation in (25) above. Although the syntactic representation of the Unselective Binding theory is relatively simple, the compositional semantics is not as straightforward. One semantics has been proposed by Berman (1994). He provides an interpretation algorithm for the Q morpheme which binds wh-variables, as shown here in (26).

⁴ Tsai (1999) revives an old observation made during the early years of generative grammar. English wh-pronouns seem to be built with a wh-operator and something else. For example: wh-at, wh-o, wh-om, wh-ere, wh-en. Similarly, there are th-at, th-ey, th-em, th-ere, th-en. Such evidence can be argued to show that English wh-pronouns are operator-variable construction.

⁵ I'll talk about these different readings later in this chapter in Table 2.2 and give related examples.

$$(26) \llbracket Q\varphi \rrbracket^{M,g} = \{p: \exists (x_1 \dots x_n)[p = \llbracket \varphi \rrbracket^{M,g'}]\}, \text{ where } g' \approx_{\varphi} g$$

In this semantic rule, the Q morpheme is similar to the operator in (25), and if we assume that the semantic contribution of the interrogative C is vacuous, then the IP in (25) corresponds to φ . The clause $g' \approx_{\varphi} g$ means that the assignment function g' is exactly the same as the assignment function g except possibly on the values assigned to the free variables in φ . In Berman's (1994) original semantics shown in (26), there is no index on the Q operator, and the function of g' is not obvious. To make the semantics of this Q operator more concrete, I'll add the relevant indices and revise (26) using Beck's (2006) proposal for the semantics of the Q operator, minus the assignment function for focus interpretation. Thus the indexed version of (26) is:

$$(27) \llbracket Q_{1\dots n} \varphi \rrbracket^{M,g} = \{p: \exists (x_1 \dots x_n)[p = \llbracket \varphi \rrbracket^{M,g[x_1/1] \dots [x_n/n]}]\}$$

Note that in (27), I omit one more series of indices on variables in order to make the notation easier. The symbols $x_1 \dots x_n$ are different variables, and each of them carries an index i , and these indices are marked on the Q morpheme. The new assignments added to the assignment function g are those from the indices $i_1 \dots i_n$ to the variables $x_1 \dots x_n$. Thus in order to simplify the notation, I assume that the indices carried by the variables $x_1 \dots x_n$ are $1 \dots n$ respectively.

Another important point is the interpretation of wh-in-situ is the translation of wh-phrases. As has been noted above, in the Chinese-type wh-questions, the wh-phrases are similar to indefinites. Thus these wh-phrases should be translated into variables of some sort. Suppose we translate the wh-pronoun *shei*₁ in (25) as a variable x_1 , then we can directly apply the semantics of (27) to derive the denotation of (25) in a compositional fashion, as shown in (28)

(28) Compositional derivation

$$\begin{aligned}
& \llbracket [\text{CP Op}_{1[\text{Q}]} \text{C} [\text{IP Yuehan xihuan shei}_1]] \rrbracket^{M,g} \\
&= \{p: \exists x_1. [p = \llbracket \text{Yuehan xihuan } x_1 \rrbracket^{M,g[x1/1]}]\} \\
&= \{p: \exists x_1. [p = \llbracket \text{Yuehan xihuan } x_1 \rrbracket^{M,g[x1/1]}]\} \\
&= \{p: \exists x_1. [p = \llbracket \text{xihuan} \rrbracket^{M,g[x1/1]} \llbracket x_1 \rrbracket^{M,g[x1/1]} \llbracket \text{John} \rrbracket^{M,g[x1/1]}]\} \\
&= \{p: \exists x_1. [p = \lambda w. \text{like}(x_1)(\text{John})(w)]\}^6 \\
&= \{p: \exists x_1. [p = \lambda w. \text{John likes } x_1 \text{ in } w]\}
\end{aligned}$$

The final step in the derivation in (28) gives us the denotation of the wh-question. But there is one problem: the domain restriction of the wh-pronoun *shei* is not represented in the formula. Ideally, the final step of the compositional semantics should look like (29), in which the wh-pronoun is translated as a separate conjunction that provides the domain restriction.

$$(29) \{p: \exists x_1. \text{person}(x_1)(w_0) \wedge p = \lambda w. \text{John likes } x_1 \text{ in } w\}$$

Thus the problem with the semantics of the Q morpheme proposed by Berman (1994) is that it is sketchy and representational rather than compositional. It does not provide a mechanism to extract the domain restriction of the wh-phrases⁷. Moreover, he does not specify how wh-indefinites are to be translated systematically. In the final step of (28), even if we want to derive a *de dicto* reading of the wh-pronoun by keeping the

⁶ I will write the arguments for the object, the subject and the world variable in that order in brackets after the predicate. For example “like(x)(y)(w)” means that y likes x in w. An alternative notation is to write the arguments as an n-tuple. For example, “like(w, x, y)” would mean that x likes y in w. Such notational choices should not matter for our purposes here.

⁷ One way of getting the domain restriction to work in situ is to use a choice function as argued by Reinhart (1998). Beck (2006) mentions another possibility in terms of presupposition, as originally argued by Rullmann and Beck (1998).

domain restriction inside the proposition, we still do not know how to translate the wh-pronoun in order to achieve that. Actually we might go back to Heim's (1982) semantics of unselective binding. In her system, the syntactic representation has to be reconfigured into a tripartite structure at a level equivalent to the LF. The semantic representation of (25) can be sketched as in Figure 2.2.

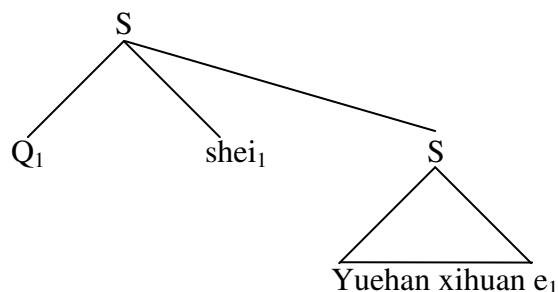


Figure 2.2: A tripartite structure for a wh-question

Heim (1982) calls such structures the Logical Form of the corresponding syntactic representations. To derive the above logical form from the surface syntax, Heim (1982) proposes the following transformational rules.

(30) Transformational rules

NP-indexing: Assign every NP a referential index

NP-prefixing: Adjoin every non-pronominal NP to S, leaving behind a co-indexed empty NP.

Quantifier Construal: Attach every quantifier as a leftmost immediate constituent of S.

Quantifier Indexing: Copy the referential index of every indefinite NP as a selection index onto the lowest c-commanding quantifier.

Heim (1982) does not discuss the semantics of the Q morpheme and wh-indefinites. However, if we treat the Q morphemes as a quantifier, and the wh-indefinites, including both wh-pronouns and wh-phrases, as indefinite NPs, we can use the transformational rules in (30) to derive the tripartite structure in Figure 2.2. By NP indexing, the wh-pronoun is given an index. Let's ignore the NP "John" for simplicity. By NP prefixing, the wh-pronoun is adjoined to S. By Quantifier Construal, the Q morpheme is adjoined to S. We assume here that the Q morpheme is merged, instead of being moved from within the S containing the wh-pronoun. Then by Quantifier Indexing, the index of the wh-pronoun is copied onto the Q morpheme. What is important in Heim's (1982) system is that indices on predicates and empty NPs with indices are treated as variables. Thus in the logical form of the tripartite structure in Figure 2.2, the empty NP e_1 is translated as x_1 . The index on the wh-pronoun *shei* is translated as a variable x_1 , and consequently the wh-pronoun is translated as an open formula $\text{person}(x_1)$. The index on the Q morpheme should be translated as a variable x_1 as well.

Therefore a direct translation of the tripartite structure in Figure 2.2 is:

(31) Translation of tripartite structure

$$\begin{aligned} & [Q_1 [\text{shei}_1 [\text{Yuehan xihuan } e_1]]] \\ & = Qx_1 [\text{person}(x_1)(w_0)] [\lambda w. \text{John likes } x_1 \text{ in } w] \end{aligned}$$

Yet the semantics in (31) is not quite what we want for the denotation of wh-questions. Thus we need a new rule to translate the tripartite structure into a question denotation. I propose the following:

(32) Question translation

If a tripartite structure is

$$Q(x_1 \dots x_n) [P(x_1 \dots x_n) (w_0)] [\lambda w. S(x_1 \dots x_n)(w)]$$

Then translate this structure into

$$\lambda p. \exists (x_1 \dots x_n) [P(x_1 \dots x_n) (w_0) \wedge p = \lambda w. S(x_1 \dots x_n)(w)]$$

By applying the translation rule in (32) to (31) we get the desired denotation of the wh-question, i.e.:

$$(33) \lambda p. \exists x_1 [\text{person}(x_1) (w_0) \wedge p = \lambda w. \text{like}(x_1)(\text{John})(w)]$$

The question translation rule that I propose in (32) is an adaption of Heim's (1982) semantics of the tripartite structure and Berman's (1994) rule for the Q morpheme. My purpose is to show how to derive a correct denotation for wh-in-situ in the Unselective Binding theory.

The tripartite strategy is not necessarily the best solution, because the whole wh-phrase is moved out in the logical form. Reinhart (1998) pointed out a problem for such movement with respect to the domain restriction of the wh-pronoun in conditionals. She proposed to use choice functions to interpret wh-phrases *in situ*, without having to resort to LF movement. I will not go into details of her argument here, and will pick up this topic later in Chapter 5.

So far I have demonstrated how the Q morpheme is interpreted compositionally, and there are various ways of achieving this goal. Therefore the Unselective Binding theory is complete in terms of the syntactic component and the semantic component. Compared to the Quantificational theory where LF movement is prescribed, the Unselective Binding theory has a simpler syntactic component where

no LF movement is needed. This is an advantage in terms of Tsai's (1999) Lexical Courtesy Hypothesis. But the semantic component of the Unselective Binding theory is complicated. Berman's (1994) semantics of the Q morpheme corresponds directly to the syntactic component. If it could derive the desired semantics it should be our best solution so far. However, as I have pointed out, there are two problems with Berman's (1994) semantics of the Q morpheme, i.e. the translation of wh-indefinites and the domain restriction. On the other hand, a possible solution along the lines of Heim's (1982) system can yield the correct semantic representation. But in order to do that, there has to be LF movement. It seems that the advantage of the Unselective Binding theory would be lost if we had to resort to LF movement.

What about the empirical side of the Unselective Binding theory as applied to Mandarin wh-questions? Is there evidence for the existence of an unselective binder or a Q morpheme? Although it is not necessary that there be an overt morpheme which can serve as the Q morpheme, and it can be regarded as a covert morpheme in the representation of certain sentences, it is still more desirable if there is indeed concrete evidence for the existence of such a morpheme. Nishigauchi (1990) is the first to have proposed to apply the Unselective Binding theory to questions in wh-in-situ languages such as Japanese. Both polarity questions and wh-questions in Japanese can be marked by the same question particle *-ka*. For example:

(34) Taro-wa tabemasita ka?

Taro-Top ate Q

Did Taro eat?

(35) Taro-wa nani-o tazunemasita ka?

Taro-Top what-Acc asked Q

What did Taro ask?

In (34), the question particle *-ka* indicates that it is a question, and similarly in (35) the same question particle is used. Nishigauchi (1990) suggests that this question particle might be the Q morpheme in Japanese. Since Japanese is traditionally regarded as a left-branching language, the position of the question particle is actually in the C area although the question particle might have moved from a position inside the wh-phrase.⁸ The situation in Mandarin is similar, but with some important differences. First, a polarity question in Mandarin is obligatorily marked by a question particle *-ma*. For example:

- (36) Yuehan chi-le ma?
 John eat-PRF Q
 Did John eat?

But the situation with Mandarin wh-questions is very different. Normally no question particle is necessary, and the question particle for polarity questions, i.e. *-ma* is not allowed in wh-questions in Mandarin. For example:

- (37) Yuehan kanjian-le shei?
 John see-PRF who
 Who did John see?
- (38) *Yuehan kanjian-le shei ma?
 John see-PRF who Q
 Intended reading: who did John see?

⁸ In Hagstrom's (1998) theory of wh-movement, the Q morpheme in Japanese is originally attached to the wh-pronoun and is later moved to the spec,C. He cites evidence from overt Q movement languages, and also historical evidence from Old Japanese, where the Q was still within the IP.

As a wh-question, (37) is perfectly acceptable without any question particle and in fact in most cases no particle is needed. Unlike the situation with the Japanese question particle *-ka* the question particle *-ma* in Mandarin is not compatible with wh-questions as shown in (38) on the intended reading of being a wh-question. Note that (38) is ok if the wh-pronoun is de-accented and gets an existential reading, and the whole sentence can be interpreted as a polarity question. I will discuss such cases in detail in Chapter 3.

Although the question particle *-ma* is not allowed in Mandarin wh-questions, sometimes another sentential particle *-ne* can be added to a wh-question. For example:

(39) Yuehan kanjian-le shei ne?

John see-PRF who PAR

Who did John see?

In (39), the sentential particle is added to the wh-question in (37), and it does not change the meaning of the question in an obvious way. The difference between (39) and (37) is quite subtle. But the point is that the particle *-ne* seems to be some sort of question particle, parallel to the Japanese *-ka*. Cheng (1991) notices this important fact, and she takes it for granted that this particle *-ne* is a question particle. She also argues that in the absence of any overt question particle, the possibility of the question particle *-ne* in (37) suggests that a covert question particle is always present. Based upon this claim, she proposes a Clausal Typing Hypothesis, which says:

(40) Clausal Typing Hypothesis (Cheng 1991: 24)

In-situ languages have wh-particles. Languages with wh-particles are in-situ languages.

Simply put, the Clausal Typing Hypothesis says that there should be some overt way of marking the type of a sentence in language. Therefore if there is a question particle to mark certain sentences as questions, there is no need of wh-movement. However, the semantic contribution of the particle *-ne* is a very controversial matter. There is no agreement as to whether this particle is a question particle. Although Cheng (1991) does not give detailed argument for her treatment of the particle *-ne* as a question particle, the importance of this claim nevertheless requires some more arguments. I will give evidence here against her claim of the particle *-ne* being a question particle. If my argument is correct, then there is no question particle in Mandarin that is comparable to Japanese. Then the claim for the existence of a Q morpheme in Mandarin is weakened.

First, there are many sentential particles in Mandarin, e.g. *-ma*, *-ba*, *-ne*, *-a*.⁹ But none of these can take narrow scope in an embedded clause. What is relevant for our purposes here is that the particle *-ne* can not be embedded under [+wh] verbs mentioned earlier in discussion of Huang's (1982a) classification of verbs. For example:

(41) *Zhangsan wen wo shei mai-le shu ne?

Zhangsan ask me who bought books PAR

Intended reading: Zhangsan asked me who bought books.

The sentence in (41) is the same as (14), except for the sentential particle *-ne*, and this sentential particle makes the whole sentence ungrammatical. As we noted earlier,

⁹ In one of the uses of *-ba* it expresses an assumption, and *p-ba* can be translated as I assume that p. The particle *-a* is usually used to express a stronger emotion, such as exclamation, surprise, etc. The particle *-ma* is used to form polarity questions.

[+wh] verbs force an embedded question reading. In (41) the particle *–ne* must take embedded scope, and this scope is incompatible with the meaning of this particle. In comparison, there is no such restriction on the Japanese *–ka*, for example:

- (42) Taro-wa Yamada-ga dare-ni nani-o okutta ka tazunemasita.
 Taro-Top Yamada-Nom who-Dat what-Acc sent Q asked
 Taro asked what Yamada sent to whom.

The example in (42) is based on Shimoyama's (2001) example (6). It shows that the question particle *–ka* in Japanese can be used with either a root question or an embedded question. Thus we may ask why the particle *–ne* in Mandarin can not take embedded scope, if it is indeed a question particle, as claimed by Cheng (1991). As for the [-wh] verbs and the [±wh] verbs, they are compatible with *–ne* as long as a matrix scope is available. For example:

- (43) Zhangsan xiangxin shei mai-le shu ne ?
 Zhangsan believe who bought books PAR
 Who does Zhangsan believe bought books?
 (44) Zhangsan zhidao shei mai-le shu ne
 Zhangsan know who bought books PAR
 a. Who does Zhangsan know bought books?
 b. (unavailable reading) *Zhangsan knows who bought books.

The above data show that the particle *–ne* is strictly speaker-oriented. Only when it is used in a root question will it be acceptable and the semantic contribution has to do with the speaker's attitude towards the question that he/she is asking. Use of the

sentential particle *–ne* makes the question sound more like a question that the speaker asks himself/herself. Another effect of using such a particle is to strengthen the interrogative force of the question that is asked. On the other hand, whenever the subject related to the question is not the speaker, as shown in (44)-b, the use of *–ne* leads to ungrammaticality.¹⁰ Thus this particle does not seem to be a genuine question particle which binds question words and has a wider syntactic distribution.

Second, there are many Chinese linguists who support the view that *–ne* does not contribute any question meaning. Among these linguists are Shao (1989, 1996), Hu (1981), Shi and Zhang (1995). I will review Shao's (1996) argument. Since *–ne* is optional in wh-question in Mandarin, it is difficult to argue whether *–ne* contributes to the question meaning of a sentence. Therefore, Shao (1996) sets out to prove that in question forms other than wh-questions the *–ne* does not have any question meaning. Shao's (1996) argument is based on Lu's (1984) claim that in elliptical question forms such as (45) the particle *–ne* is what makes the sentence a question.

(45) Zhangsan ne?¹¹

Zhangsan PAR

What about Zhangsan?

(46) Zhangsan?¹²

Zhangsan

Do you mean Zhangsan?

¹⁰ The other three sentential particles that I mentioned above cannot be embedded either. They are all speaker-oriented as well in that they express the speaker's point of view. It seems to me that these particles function as some sort of discourse particles, rather than semantic binders. On the other hand, the particle *–ne* is compatible with A-not-A questions and alternative questions.

¹¹ The typical context in which this question is used is as a follow-up question in a discourse. For example, when we are talking about our friends, after asking about Mary whether or not she has finished her term paper, we can use this question to ask the same question about Zhangsan.

¹² The typical context in which this question is used is as a confirmation about something that has just been said. For example, when A asks about Zhangsan, and B wants to make sure that it is Zhangsan that A is asking about, B can utter this question. Both (46) and (47) can be used in such contexts.

(47) Zhangsan ma?

Zhangsan Q

Do you mean Zhangsan?

Besides the elliptical form¹³ in (45), Lu (1984) also notices two other forms. In (46), the NP “Zhangsan” is uttered with a rising intonation which is typical of polarity questions. The meaning of (46), according to Lu (1984), is a polarity question. Consequently the use of the question particle *–ma* in (47) with no question intonation amounts to the same question meaning as (46). Lu (1984) argues that (45) cannot be regarded as derived from (46), and thus the question meaning of (45) must be contributed by the particle *–ne*. Shao (1996) points out that the examples used by Lu (1984) for the elliptical questions of the form of (46) are all echo questions, as can be seen from the English translation of (46). In fact, in a different context, it is possible to get a non-polarity question reading for elliptical questions like (46), for example:

(48) A: Huan ni che yaoshi, xiexie.

Return you car key thank

Here’s your car key. Thanks.

B: Beng xie, che?

Don’t thank car

No problem. Where’s my car?

A: Jiu ting zai menkou.

Just park at door-mouth

It’s parked just by the door.

¹³ It is elliptical in the sense that it is based upon a question that has been asked. The same question is being asked about a different person.

In (48), the elliptical question uttered by B can be understood only as a wh-question, as can be seen from the English translation. In this case, the elliptical question is the same as (49) where the particle *–ne* is added.

(49) Che ne?

Car PAR

Where is my car?

Shao (1996) uses the above argument based on context to show that the elliptical form in (46) is ambiguous between an echo question/polarity question and a wh-question depending on the context. The particle *–ne* is not what actually gives the question meaning to the elliptical forms in (45) and (49). Although it can be argued that the particle *–ne* can serve to distinguish between different types of questions such as polarity questions and wh-questions, the particle itself does not distinguish questions from non-questions¹⁴. If the particle *–ne* were what turns an open formula into a question, then the elliptical questions without any particle mentioned above should be inherently ambiguous, i.e. no context would suffice to distinguish an elliptical polarity question from an elliptical wh-question. However this is not the case. Therefore Shao's (1996) argument shows that the particle *–ne* is not a wh-question particle in the strict sense.¹⁵ This is an important claim, since in Cheng's (1991) Clausal Typing Hypothesis and the Unselective Binding theory, it is the question particle or the Q morpheme that give rise to the question meaning. If the particle *–ne* in Mandarin does

¹⁴ Note that Shao's (1996) argument also proves that the particle *–ma* does not contribute any question meaning either. Actually this is a desired result for my proposal to be made in section 2.5.

¹⁵ Shao's (1996) argument is actually not a sound argument for the claim that *–ne* is not a question particle. But it is a good counter-argument against Lu (1984).

not give rise to any question meaning in any type of questions, be it wh-questions or elliptical question forms, it can not be a question particle in the technical sense, although it is compatible with certain types of questions. Shao (1996) cites many examples and constructs a very detailed analysis based on contexts. The final conclusion is that the semantic contribution of the particle *-ne* in a wh-question is to emphasize the wh-phrase and reinforce the interrogative force of the question. It is rightly due to this meaning aspect of the particle *-ne* that it usually co-occurs with words such as *daodi* and *jiujing*, which function similarly to “on earth”, “in the world” and similar adverbial phrases in English wh-questions. Such phrases can be said to “reinforce” the interrogative meaning of the question in which they occur. In some sense, such “reinforcement” implies the strong emotion or attitude held by the relevant individual towards the question or the answers to this question. For example:

- (50) Zhangsan daodi/jiujing xihuan shei ne?
 Zhangsan on earth/in the world like who PAR
 Who on earth/in the world does Zhangsan like?

In (50), the use of the particle *-ne* makes the sentence sounds better, when it has the adverbs *daodi* and *jiujing*, although it is still good to go without the particle *-ne*. The use of *daodi/jiujing...ne* makes the question stronger. Moreover, it seems that such adverbs have a speaker-oriented meaning as well. For example:

- (51) ??Zhangsan zhidao Lisi daodi xihuan shei.
 Zhangsan know Lisi on earth like who
 Zhangsan knows who on earth Lisi likes.

The sentence in (51) sounds very odd, since the *daodi* is related to the matrix subject *Zhangsan*. The intended meaning of this sentence is that the matrix subject really has this strong emotion about the answers to the question in the embedded question. Although such a reading is not totally out, it actually seems to suggest that the *daodi* reveals the speaker's attitude, instead of the matrix subject.¹⁶

Although it is still yet to be worked out as to what Shao means by “emphasis” and “reinforcement”, it is clear that the particle *-ne* does not contribute any question meaning by itself.

Third, if the particle *-ne* is a Q morpheme equivalent to the Japanese *-ka*, then it amounts to saying that the interrogative C in Mandarin is sentence final, just like in Japanese. Although this is a desirable claim for Japanese, because Japanese is a left-branching language, it is syntactically problematic for Mandarin, because Mandarin is generally a right-branching language, like English. The claim of the question particle status of *-ne* leads to overt IP raising, which is exactly the claim made by Sybesma (1999). Based upon the same claim made by Cheng (1991) about the particle *-ne* as a question particle, Sybesma (1999) argues that the surface position of the interrogative C in Mandarin is sentence-final, and that the I contains a Q feature which binds the wh-variables. In English, the binder-bindee domain is wh-pronouns themselves, while in Mandarin the binder-bindee domain is the IP. If we suppose that the minimal domain of the binder-bindee relation has to move to spec,CP to check the Q feature, just as in wh-movement in English, then it triggers overt IP movement in Mandarin

¹⁶ Apparently there is no such speaker-oriented meaning for the English “on earth” and “in the world” phrases (Mats Rooth, *pc*). For example:

John wants to know who on God's earth understands that formula.

The embedded phrase “on God's earth” can be said to reveal the attitudes towards the embedded question held by the matrix clause subject “John”. I am not sure why this is the case. It might simply be due to different pragmatic constraint on the use of these phrases in different languages.

from the usual position inside CP to the spec position of CP, as shown in Figure 2.3.

We see that the IP in Mandarin is equivalent to a wh-pronoun in English. In English, it is the wh-pronoun that moves to spec,C to check the wh-feature, while it is the IP that moves in Mandarin.

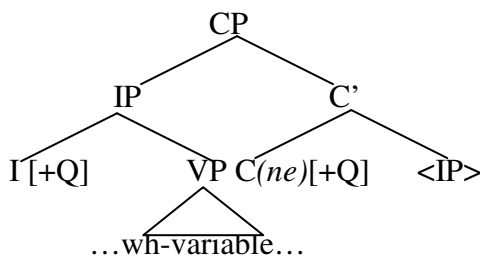


Figure 2.3: Sybesma's (1999) tree structure for Mandarin wh-in-situ

This new theory is a very interesting claim, but as I have argued earlier in this chapter, the attractiveness of the Unselective Binding theory in light of Tsai's (1999) Lexical Courtesy Hypothesis lies in the fact that no movement of the wh-phrases is needed for concerns of Economy. Clearly, Sybesma's (1999) theory of IP movement is "costly" in terms of both theory and empirical evidence.

Fourth, the simple fact that in most cases the particle *-ne* is just not used at all in wh-questions is a good counter-argument against the claim of it being a question particle. Shi and Zhang (1995) counted all the 367 wh-questions in the play *Thunderstorm*¹⁷, and only 19 of these wh-questions have the particle *-ne*, which is about only 5% of all the cases of wh-questions. An unbiased wh-question never has the particle *-ne*, and the addition of this particle has to obey very specific conditions, such as speaker-orientedness, reinforcement of the asking act, and etc.

¹⁷ "Thunderstorm" by the Chinese dramatist Cao Yu is used as a standard Mandarin corpus by many Chinese linguists.

I have given four arguments against the claim that the particle *–ne* is a question particle. I think it is sufficient to show that there is no conclusive evidence for the existence of a question particle in Mandarin wh-questions, be it overt or covert, as claimed by Cheng (1991). The lack of evidence for a wh-question morpheme in Mandarin is a further problem for the Unselective Binding theory.

To sum up this section, the Unselective Binding theory starts out as a simpler explanation for wh-in-situ. But the semantic interpretation is relatively more complicated, since it is technically difficult to get the domain restriction out of the IP. Moreover, there is no empirical evidence for the existence of a question morpheme in Mandarin wh-questions. Then we may ask what an ideal theory for Mandarin wh-questions should look like. In the next section, I will discuss the Alternative Semantics theory and argue that it is a better theory for Mandarin wh-questions.

2.4 The Alternative Semantics Theory

It has long been noticed by linguists that in many wh-in-situ languages wh-pronouns and wh-phrases appear to lack inherent quantificational force. They can have different quantificational interpretations under certain conditions. In this sense, they are similar to indefinites, because indefinites do not have quantificational force either, as has been held as true since Heim's (1982) original research. The standard semantics of indefinites has been the Unselective Binding theory and Dynamic semantics. I have shown in the previous section how this theory of indefinites has been applied to wh-in-situ. In this section, I will discuss a new semantic proposal proposed by Shimoyama (2001, 2006) and Kratzer (2006). This proposal is originally based upon the different binding possibilities of indeterminate phrases in Japanese, and then it is applied to indefinites in general by Kratzer (2006).

Japanese wh-phrases have been called “indeterminate phrases”, because their interpretations depend on different particles. For example¹⁸:

(52) Taro-wa nani-o tazunemasita ka?

Taro-Top what-Acc asked Q

What did Taro ask?

(53) Dono gakusei-mo odotta.

Which student-MO danced

Every student danced.

(54) Naoya-ga nani-ka-o nomiya-de nonda no?

Naoya-Nom what-KA-Acc bar-Loc drank Q

Did Naoya drink something at the bar?

If a wh-phrase is associated with a question particle located in the specifier position of C in a clause, be it embedded or matrix, it is interpreted as a question phrase, as shown in (52), where the wh-indeterminate *nani* is associated with the question particle *–ka*.

If a wh-phrase is associated with the particle *–mo*, it is interpreted as a universal construction as shown in (53), in which the indeterminate wh-phrase *dono gakusei* is associated with the particle *–mo*. If the particle *–ka* is added to a wh-indeterminate, it is interpreted as an existential construction, as shown in (54), in which the wh-indeterminate *nani* is next to the particle *–ka*.

Such data can be interpreted by the Unselective Binding theory, and indeed these different particles as binders or operators are good evidence for the existence of an unselective binder. But Shimoyama (2001) proposes a more straightforward theory

¹⁸ Examples (52) and (53) are taken from Shimoyama (2006: 141 and 139). Example (54) is taken from Haida (2008: 179).

of Japanese indeterminate phrases in the framework of Alternative Semantics (see Hamblin 1973, and Rooth 1985, 1992). In this theory, the indeterminate phrases denote sets of individuals; the rest of the sentence denotes a set of functions, in most cases a singleton set. These two sets can then be composed according to the following Image Construction Functional Application rule.

(55) Image Construction Functional Application¹⁹

If α is a branching node with daughters β and γ , and $\llbracket \beta \rrbracket^{w,g} \subseteq D_{\langle \sigma \rangle}$ and $\llbracket \gamma \rrbracket^{w,g} \subseteq D_\sigma$, $\llbracket \alpha \rrbracket^{w,g} = \{f(x) \in D_\tau : f \in \llbracket \beta \rrbracket^{w,g} \ \& \ x \in \llbracket \gamma \rrbracket^{w,g}\}$

This Image Construction Functional Application yields a set of alternatives. Then this set of alternatives needs to be closed by certain operators, e.g. the question operator, the universal operator, etc. These are called propositional operators²⁰ in Kratzer's (2006) most recent version of this theory. For example, in (56) the Japanese indeterminate wh-pronoun *dare* ("who") denotes a set of individuals as shown in (57), and the rest of the sentence denotes a singleton set of functions as shown in (58), and

¹⁹ This is not Shimoyama's (2006) original terminology. She calls this rule "pointwise functional application". But according to the description of this rule, the functional application is based upon an image construction, instead of pointwise composition. Therefore a better terminology of this rule should be Image Construction Functional Application. Note that Shimoyama's (2006) footnote 20 attributes this rule to Rooth (1985, 1996). The general schemas FA for functional application, FA^I for image construction functional application and FA^P for pointwise functional application are:

$$\begin{aligned} \text{FA: } & \lambda f \lambda a. f(a) \\ \text{FA}^I: & \lambda F \lambda A \lambda p. \exists f \exists a [F(f) \ \& \ A(a) \ \& \ p=f(a)] \\ \text{FA}^P: & \lambda f \lambda g \lambda x. f(x)+g(x) \end{aligned}$$

According to the above schemas, the pointwise functional application rule proposed in Shimoyama (2006) should really be called image construction functional application, which is in line with Rooth's (1985) original use of the relevant terms.

²⁰ Actually in Shimoyama's (2001) original proposal, the set of alternatives can be closed at different stages of the derivation, since the position of the different particles, e.g. *-mo*, *-ka*, can be sentence internal. The ideal position for this theory is in the C area, where they function as propositional operators as stated in Kratzer (2006).

by Image Construction Functional Application, we can get a set of alternatives, as shown in (59):

- (56) Dare-ga odorimasi ka?
 Who-Nom dance Q
 Who dances?
- (57) $\llbracket \text{dare} \rrbracket^{w,g} = \{x \in D_e : \text{person}(x)(w)\}$
- (58) $\llbracket \text{odorimasu} \rrbracket^{w,g} = \{ \lambda x. \lambda w'. \text{dance}(x)(w') \}$
- (59) $\llbracket \text{dare odorimasu} \rrbracket^{w,g}$
 $= \{ f(x) : f \in \llbracket \text{odorimasu} \rrbracket^{w,g} \ \& \ x \in \llbracket \text{dare} \rrbracket^{w,g} \}$
 $= \{ \lambda w'. \text{dance}(x)(w') : \text{person}(x)(w) \}$
 $= \{ p : \exists x [\text{person}(x)(w) \ \& \ p = \lambda w'. \text{dance}(x)(w')] \}$ ²¹

The set of alternatives in (59) can then interact with different propositional quantifiers according to the following rule proposed by Menéndez-Benito (2005).

(60) Proposition closure

Where \mathcal{A} is a set of propositional alternatives,

- a. $\llbracket \exists \rrbracket^w(\mathcal{A}) = \{ \lambda w'. \exists p \in \mathcal{A} \ \& \ p(w') \}$
- b. $\llbracket \forall \rrbracket^w(\mathcal{A}) = \{ \lambda w'. \forall p [p \in \mathcal{A} \rightarrow p(w')] \}$

Note that the existential quantifier in (60) and the universal quantifier in (60) quantify over propositions directly, thus the name “propositional quantifiers”. The advantage of

²¹ Note here the indeterminate phrase denotes entities in the evaluation world. It will be interesting to see how the *de re* / *de dicto* distinction can be incorporated into this system.

this theory is that “it automatically derives the locality conditions for the association between indeterminate phrases and quantificational operators”²² (Kratzer 2006).

The wh-phrases in Mandarin share many similar properties with the indeterminate phrases in Japanese. Most wh-phrases in Mandarin can be interpreted as having different quantificational forces under different conditions. We have seen examples of Mandarin wh-questions. Therefore I will not give more such examples here, but will only show what other interpretations might also be possible.

Wh-phrases can be interpreted as an existential quantifier under certain conditions. One of such condition is the use of certain modal adverbs which express possibilities or certainties, e.g. *yiding* (“definitely”). All wh-arguments can be interpreted this way, e.g. in (61). There are many other licensing environments, and I will talk about the licensing of wh-existentials in more detail in Chapter 3. On the other hand wh-adjuncts normally do not have this existential reading, even under the correct conditions. This can be shown in (62) and (63) for the manner adverb *zenmeyang* and the reason-why *weishenme*. The only exception is the purpose-why *weile-shenme*. It behaves more like wh-arguments, and can be interpreted as an existential, as shown in (64).

(61) Zhangsan yiding kanjian-le shei.

Zhangsan definitely see-PRF who

Zhangsan must have seen someone.

²² To put this in more detail, for example, in Japanese the wh-indeterminate phrases contribute a set of alternatives, and they keep expanding until they meet a binder. The various island constraints in Japanese involve a configuration of association between the wh-variable and a particle with an intervening particle that can close off the alternative set. For example:

*[[...wh...] -ka/mo ...]-ka/mo

The underlining indicates association. The alternative set is closed by the intervening -ka/mo, and then any other binders will be redundant.

- (62) *Zhangsan yiding zenmeyang tiao-le wu.
 Zhangsan definitely how jump-PRF dance
 Zhangsan must have danced in certain manner.
- (63) *Zhangsan yiding weishenme da-le Lisi.
 Zhangsan definitely why hit-PRF Lisi
 Intended reading: Zhangsan must have hit Lisi for some reason.
- (64) Zhangsan yiding weile-shenme da-le Lisi.
 Zhangsan definitely for-what hit-PRF Lisi.
 Zhangsan must have hit Lisi for something.

Besides the existential reading, *wh*-phrases in Mandarin can also be interpreted as either a universal construction or a free-choice construction if they are associated with the adverb *dou* (“all”) to the right. But the *wh*-phrases do not necessarily have to appear immediately to the left of *dou*. As long as they are left of *dou*, it does not matter if there are other intervening elements. I will talk about two types of universal constructions including this *wh...dou* type in Chapter 4. For now, let’s look at the following examples:

- (65) Shei dou xihuan Zhangsan.
 Who all like Zhangsan
 Universal Reading: Everyone likes Zhangsan.
 Free-choice reading: No matter who it is, he/she likes Zhangsan.
- (66) Zhangsan nei-ben-shu dou kan-guo.
 Zhangsan which-CL-book all look-Exp
 Universal: Zhangsan has read every book.
 Free-choice: No matter which book it is, Zhangsan has read it.

- (67) (Zhangsan shi-guo henduo fangfa, keshi) zenme dou bu neng
 Zhangsan try-EXP many method but how all not can
 ba huar gua dao qiang shang.
 BA picture hang to wall up
 Zhangsan tried many different methods, but no matter what he did,
 he could still not hang the picture on the wall.
- (68) *Weishenme Zhangsan dou yao qu kan dianying.
 Why Zhangsan all want go look movie
 Intended readings: Zhangsan wanted to go to see a movie
 for every reason.
- (69) Zhangsan weile-shenme dou yao qu kan dianying
 Zhangsan for-what all want go look movie
 No matter what it is for, Zhangsan still wants to go to see a movie.

All wh-arguments can interact with this *dou* in a universal or free-choice construction, as shown in (65) and (66). Wh-adjuncts such as *zenme(yang)* and *weishenme* are a little complicated. With enough context, it is possible to get a free-choice reading for *zenme(yang)*, as shown in (67), but the reason-why *weishenme* can not be used with *dou*, as shown in (68), while the purpose-why *weile-shenme* can get a free-choice reading when associated with *dou*, as shown in (69).

The following table summarizes the interpretative possibilities of wh-phrases in Mandarin when they are associated with different adverbs or when they appear in different licensing environments, as discussed above. The tick symbol means that the relevant reading is possible, while the check symbol means that the relevant reading is not available.

Table 2.2: Interpretation possibilities of Mandarin wh-phrases

	Interrogative (no binder)	Existential (no binder)	Free-choice (wh...dou)	Universal (wh...dou)
shei	✓	✓	✓	✓
shenme	✓	✓	✓	✓
na/nei (3 rd tone)	✓	✓	✓	✓
na/shenme-difang	✓	✓	✓	✓
shenme-shihou	✓	✓	✓	✓
zenme(yang)	✓	✗	✓	✗
weishenme	✓	✗	✗	✗
weile-shenme	✓	✓	✓	✗

In this chapter, I will deal with the interrogative interpretations of wh-phrases in Mandarin. I will discuss the existential readings in Chapter 3 in the framework of the Alternative Semantics theory. Since the free-choice reading and the universal reading share some similarity, I will compare them with another universal construction, i.e. the *mei...dou* construction in Chapter 4.

Now I have shown that Mandarin wh-phrases lack any inherent quantificational force, just like the indeterminate phrases in Japanese. It is only natural to assume that the same theory that can account for the indeterminate phrases in Japanese can be extended to account for the wh-phrases in Mandarin as well. Thus we have the third theory of questions I have set out to compare at the beginning of chapter, i.e. the Alternative Semantics theory. Take the following sentence for example:

(70) Shei xihuan Zhangsan?

Who likes Zhangsan

Who likes Zhangsan?

According this new Alternative Semantics theory, wh-indefinites denote sets of individuals. Predicates denote a set of functions. As for proper names, I assume that they denote singleton sets of individuals. Therefore the compositional semantics of (70) should be:

(71) Compositional semantics of wh-indefinites in Mandarin

- a. $\llbracket \text{shei} \rrbracket^{w,g} = \{x \in D_e : \text{person}(x)(w)\}$
- b. $\llbracket \text{xihuan} \rrbracket^{w,g} = \{ \lambda x. \lambda y. \lambda w'. \text{like}(x)(y)(w') \}$
- c. $\llbracket \text{Zhangsan} \rrbracket^{w,g} = \{z\}$
- d. $\llbracket \text{shei xihuan Zhangsan} \rrbracket^{w,g}$
 $= \llbracket \text{xihuan} \rrbracket^{w,g} \llbracket \text{Zhangsan} \rrbracket^{w,g} \llbracket \text{shei} \rrbracket^{w,g}$
 $= \{ (f(x))(y) : f \in \llbracket \text{xihuan} \rrbracket^{w,g} \ \& \ x \in \llbracket \text{Zhangsan} \rrbracket^{w,g} \ \& \ y \in \llbracket \text{shei} \rrbracket^{w,g} \}$
 $= \{ \lambda y. \lambda w'. \text{like}(z)(y)(w') : y \in \llbracket \text{shei} \rrbracket^{w,g} \}$
 $= \{ \lambda w'. \text{like}(z)(y)(w') : \text{person}(y)(w) \}$

Note that in the sample derivation in (71), we have a transitive verb, where the Image Construction Functional Application rule in (55) can not be applied directly. Thus the rule might need to be extended to n-place predicates, either in a cyclic application fashion or in a one-step way as has been done here in (71). But this step is not crucial here. What I want to show is that Mandarin wh-questions can be interpreted via this Alternative Semantics. Now a natural conclusion about the syntax of Mandarin wh-questions is that “what you get is what you see”, without any LF movement or invisible Q morpheme. The syntactic representation of (70) is thus:

(72) $[_{CP} C [_{IP} \text{Zhangsan xihuan shei}]]$

If we assume that every type of sentence contains a complementizer which indicates the type of the sentence, then in wh-questions, we would still have a C with a Q feature. Thus in the syntactic representation in (72), with no LF movement of the wh-phrase, we might need to move the feature [wh] carried by the wh-pronoun to the spec,CP for checking, as proposed by Chomsky (1995) and Pesetsky (2000). For example:

$$(73) \quad [C_{[uWh]} [Zhangsan \ xihuan \ shei_{[wh, \ focus]}] \rightarrow \\ [[wh] C_{[uWh]} [Zhangsan \ xihuan \ shei_{[focus]}]]$$

What does this feature-movement processes mean in terms of Tsai's (1999) LCH? I use his LCH as a basic guideline for my discussion. If the representation in (72) is still the most economical compared to the LF movement approach and the unselective binding approach, then it would indeed be a very appealing solution so far. Since the LCH does not deal with feature movement specifically, it is reasonable to assume that feature movement is more economical than phrasal movement, since a smaller portion of the phrase is moved in the feature movement cases. But as to the comparative economy of unselective binding and feature movement, there need to be more compelling evidence and arguments, to which I do not have a good answer yet.

On the other hand, in terms of semantics, the interrogative C in the presentation in (72) is not necessarily needed, since the compositional semantics derives a question denotation without any semantic contribution from the C. The semantics indicates what type of sentence it is. But conceptually the interrogative C is still needed for feature checking and other semantic processes, such as the ~ operator

proposed by Rooth (1985). Therefore I will assume that the LF in (72) is the correct form in the Alternative Semantics for wh-questions in Mandarin.

Now let's compare the other two representations in the Quantificational theory and the Unselective Binding theory, as illustrated below.

(74) $[_{CP} \text{Shei}_1 C [_{IP} \text{Zhangsan xihuan } t_1]]$ (LF movement)

(75) $[_{CP} \text{Op}_1 C [_{IP} \text{Zhangsan xihuan } x_1]]$ (Unselective Binding)

All these three syntactic representations have corresponding semantic interpretation component. However in light of the Minimalist concerns of Economy as stated in Tsai's (1999) Lexical Courtesy Hypothesis, repeated here as (76), the representation in (72) is the simplest one, without even the need for an unselective binder.

(76) Lexical Courtesy Hypothesis (LCH) (Tsai 1999:4)

If a language may introduce an operator by Merger, it will not resort to Chain formation.

But if there is indeed feature movement in Mandarin, (73) is still more economical than phrasal LF movement, and it is possibly also more economical than the Unselective Binding approach, pending more evidence.

One of the reasons why the type of syntactic representation in (72) has not been proposed in the literature so far is probably due to the lack of a semantic interpretation component. Without a semantic interpretation mechanism like the Alternative Semantics the syntactic representation in (72) would be much less appealing. Another problem with the syntactic representation in (72) is the scope-marking of the interrogatives. In the Quantificational theory, scope-marking takes

place when the *wh*-phrase moves to the specifier position of the interrogative *C* for feature checking reasons. In the Unselective Binding theory, scope-marking takes place when the *Q* morpheme checks the *Q* feature with the interrogative *C*'s *Q* feature in a spec-head configuration. Now the Alternative Semantics theory also needs a way of scope-marking, and I will deal with this in section 2.6.

One of the advantages of this Alternative Semantics theory is that *Q* morphemes are theoretically redundant. The Hamblin semantics of questions is a set of propositions, and the direct result of the Image Construction Functional Application is exactly such a set of propositions. In the propositional quantifiers as shown in (60), there is not an operator or quantifier for the interrogative reading. In fact, the Alternative Semantics is an anti-quantificational theory in that the interrogative readings are not quantificational. I have argued in section 2.3 against the existence of a question particle *–ne* for *wh*-questions in Mandarin. This is indeed in line with what this Alternative Semantics theory predicts, and is thus further support for this theory as applied to Mandarin data. In contrast, there is a question particle *–ka* in Japanese. This is a problem for Shimoyama (2006). She notices this in a footnote:

Note that the semantic contribution of the question particle *ka* may now be seen as a rather trivial one. Alternatively, *ka* can be considered to return a singleton set whose sole member is a question denotation as proposed in Groenendijk and Stohkof (1982).

——Shimoyama (2006: 154 footnote 21)

Kratzer and Shimoyama (2002) give a detailed semantics of how such question particles can turn the Hamblin set into a partition, as shown in (77). These are the original formulae given in their paper.

$$(77) \llbracket Q \alpha \rrbracket^{w,g} = \llbracket \alpha \rrbracket^{w,g} \text{ or (Groenendijk \& Stokhof 1984)}$$

$$\llbracket Q \alpha \rrbracket^{w,g} = \{ \lambda w'. \forall p(p \in \llbracket \alpha \rrbracket^{w,g} \rightarrow (p(w)=1 \leftrightarrow p(w')=1)) \}$$

The particle $-ka$ is an instance of the Q operator in (77). The α corresponds to the part of the question without the question particle, and therefore $\llbracket \alpha \rrbracket^{w,g}$ represents the Hamblin set of propositions. Note that even in (77) Kratzer and Shimoyama are considering two possibilities of the semantic contribution of the question particle. The first possibility is that the Q is semantically vacuous. The second possibility is that the Q turns the alternative set into a partition. However the formula in (77) is not a partition, i.e. the intension of questions in the partition theory. Instead it yields a set of possible worlds where the true answers are exactly the same as in the actual world, i.e. one cell in the partition that includes the actual world. This is actually the extension of the question in the world w . If we bind the world variable w , then we get the intension of the question. But the detailed representation of this question morpheme is not the point here. It is enough to show that the theoretical status of question particles in the Alternative Semantics theory is problematic. If the question particle $-ka$ is a function that turns a Hamblin set into a partition, then all the advantage of the Hamblin-style semantics of questions as argued by Beck and Rullmann (1999) has to be redefined, since the partition semantics is exhaustive. Then we will have to see whether or not such a particle $-ka$ is incompatible with non-exhaustive environments such as in context which enforces a “know-some” reading, e.g.:

(78) He knows where one can buy a copy of the New York Times.

(79) Who, for example, has been to the Caribbean?

In the two examples above, no exhaustive answer is needed. It has been argued by Beck and Rullmann (1999) that the Hamblin-style semantics of questions gives us more flexibility to define answers with different degree of exhaustivity, which can then account for phenomena like (78) and (79). If indeed as Kratzer and Shimoyama (2002) propose in (77), the use of the question particle *-ka* in Japanese in such non-exhaustive contexts should lead to ungrammaticality.

On the other hand, the question particle *-ka* is not obligatory. It can be omitted in some context in Japanese *wh*-questions. Hagstrom (2001: 9) reports that “it is possible in Japanese to ask a *wh*-question in which the question particle has been dropped”. His example is:

- (80) Hiro-ga nani-o tabeta
 Hiro-Nom what-Acc ate
 What did Hiro eat?

Although the exact difference between Japanese *wh*-questions with the question particle and those without the particle is a tricky matter, it is enough for our purposes here, since the omission of the question particle shows that *wh*-indefinites do not need a binder in order to receive an interrogative reading, although such particles might still have some other functions, for example, scope-marking. I will talk about this again in section 2.6.

Thus the problematic status of the question particle *-ka* in Japanese indicates that ideally such a particle is not needed at all. This is just the case in Mandarin, if we assume that the *-ne* in Mandarin is not a question particle at all, as has been shown above in section 2.3.

To sum up this section, I have shown that the Alternative Semantics theory can account for the different interpretation possibilities of Mandarin wh-phrases, and in terms of question readings, this theory gives a simple and straightforward parallel derivation. The lack of a question particle in Mandarin seems to give further support for such a theory. Besides such empirical evidence for the Alternative Semantics theory, theoretically this theory is more economical in light of Tsai's LCH.

Thus it seems to me that the Alternative Semantics theory is indeed a viable solution to wh-questions in Mandarin. The original theory proposed by Shimoyama (2001) is to account for wh-constructions. Then Kratzer (2006) extended this theory to include indefinites in general. In the next section, I will extend this theory to other types of questions in Mandarin, including polarity questions, A-not-A questions and alternative questions.

2.5 Other Types of Questions

In this section, I will show how the Alternative Semantics theory on questions can shed light on the compositional semantics of the other three types of questions in Mandarin. I will argue that these three types of questions differ from wh-questions in that the set of functions is not a singleton set such as in the case of wh-questions, and that these three types of questions differ with each other in that the functions in the set are formed at different stages of the derivation. Then I will also mention a special type of verbal "how" questions to show that the cardinality of the set of functions is not limited to two.

Besides wh-questions, there are three other types of questions in Mandarin: polarity questions, A-not-A questions, and alternative questions. Polarity questions are formed by a question intonation or by adding the question particle *-ma* to a declarative sentence. For example:

(81) Zhangsan xihuan Lisi.

Zhangsan like Lisi

Zhangsan likes Lisi.

(82) Zhangsan xihuan Lisi ma?

Zhangsan like Lisi Q

Does Zhangsan like Lisi?

If the declarative sentence in (81) is uttered with a question intonation²³, then it is interpreted as a polarity question. In (82), the question particle *–ma* turns the corresponding declarative into a question.

A-not-A questions can be formed by conjoining the negated form of a verb with the verb itself.²⁴ There might be some morphological changes to the verb if it is disyllabic. For example:

²³ The question intonation in Mandarin is not simply a rising intonation. Due to the pitch contour of lexical tones, the question intonation involves such factors as the pitch or F0, the overall register, and the contour of the tones (i.e. full tone shapes and expansion of the range of pitch).

²⁴ Adjectives that can be predicates without the verb *shi* (“be”) are also good in A-not-A questions. For example:

Zhangsan gaoxing bu gaoxing?

Zhangsan happy not happy

Is Zhangsan happy?

In this chapter I will only use examples of A-not-A questions that contain verbs, but the discussion should be equally applicable to A-not-A questions that contain adjectives.

Nouns generally cannot function as predicates in Mandarin. Although there are cases that have a noun in the predicate without any verb, these are not typical uses and they are often elliptical. Therefore nouns cannot be used to form A-not-A questions.

Prepositions sometimes can be used to form the A-not-A questions. For example:

Zhangsan gen-mei-gen Lisi qu kan dianying.

Zhangsan with-not (perfective)-with Lisi go watch movie

Did Zhangsan go to the cinema with Lisi?

But these prepositions can be considered verbs as well, as can be seen from the use of the perfective negation word *mei*. Therefore A-not-A questions formed with prepositions are similar to verbs.

(83) Zhangsan xihuan bu xihuan Lisi?

Zhangsan like not like Lisi

Does Zhangsan like Lisi ?

(84) Zhangsan xi-bu-xihuan Lisi?

In (83), the negated form of the verb *xihuan* is conjoined, and the question has a reading similar to a polarity question. In (84), only the first syllable of the verb is negated: *xi* → *bu-xi*, and this makes the whole A-not-A part look more like one unit. But this morphological change does not influence the meaning of the two sentences. It is a purely morphological process. Moreover if there is a modal verb, then the morphological change always applies to the modal verb, but not to the main verb. For example:

(85) Zhangsan hui-bu-hui xihuan Lisi?

Zhangsan will-not-will like Lisi

Will Zhangsan like Lisi?

(86) *Zhangsan hui xi-bu-xihuan Lisi

Alternative questions are formed by linking two or more sentences with *haishi* (“or”).²⁵ For example:

²⁵ In alternative questions like the following, “*Lisi haishi Mali*” seems to form a unit. But in light of sentences like (87), I will assume that “*haishi*” connects sentences, but not subsentential constituents. When there are subsentential constituents, e.g. NPs, they should be regarded as elliptical form of whole sentences.

Zhangsan xihuan Lisi haishi Mali ?
Zhangsan like Lisi or Mary
Does Zhangsan like Lisi or Mary?

- (87) Zhangsan xihuan he cha, haishi Lisi xihuan he cha?
Zhangsan like drink tea or Lisi like drink tea
Does Zhangsan like to drink tea or does Lisi like to drink tea?

Moreover these questions cannot be embedded. For example:

- (88) *Zhangsan zhidao Lisi xihuan Mali ma.
Zhangsan know Lisi like Mary Q
Intended reading: Zhangsan knows whether Lisi likes Mary.
- (89) ??Zhangsan zhidao Lisi xi-bu-xihuan Mali.
Zhangsan know Lisi like-not-like Mary
Intended reading: Zhangsan knows whether or not Lisi likes Mary.
- (90) ??Zhangsan zhidao Lisi xihuan he cha haishi kafei.
Zhangsan know Lisi like drink tea or coffee
Intended reading: Zhangsan knows whether Lisi likes tea or coffee.

Although sentence (88) is fine when it is interpreted as a root question, it is not acceptable as an embedded question. It is the same with the A-not-A and alternative questions, as shown in (89) and (90) respectively, although their acceptability is higher than (88). If an embedded question is needed, then *shi-bu-shi* (“be-not-be”) can be used to turn a declarative into an embedded question. For example:

- (91) Zhangsan zhidao Lisi shi-bu-shi xihuan Mali.
Zhangsan know Lisi be-not-be like Mary
Zhangsan knows whether Lisi likes Mary.

Although these types of questions cannot be the object of a verb, A-not-A questions and alternative questions are good when they are sentential subjects. For example:

(92) Lisi xi-bu-xihuan Mali gen wo meiyou guanxi.

Lisi like-not-like Mary with me not-have relation

Whether Lisi likes Mary is none of my business.

(93) Lisi xihuan he cha haishi kafei gen wo meiyou guanxi.

Lisi like drink tea or coffee with me not-have relation

Whether Lisi likes tea or coffee is none of my business.

It is however not clear whether there are real sentential subjects in Mandarin since the relation between the sentential subjects and the rest of the sentence is rather loose, i.e. with no formal agreement or grammatical markers. In many cases, it is possible to break the sentence into two independent sentences by using a pronoun. For example:

(94) Lisi xi-bu-xihuan Mali, zhe gen wo meiyou guanxi.

Lisi like-not-like Mary, this with me not-have relation.

Whether Lisi likes Mary is none of my business.

Thus it is not entirely clear whether these sentential subjects are indeed embedded questions or two consecutive sentences. If we put these sentential subject cases aside for the time being, we can draw the following generalizations about the distribution of non-wh questions in Mandarin: polarity questions cannot be embedded, and it always

forces a root question reading; A-not-A and alternative questions cannot be embedded and they cannot be interpreted as a root question when they are in an embedded position. But embedded A-not-A and alternative questions are more acceptable than embedded polarity questions. In what follows I will first give a semantic analysis of these three types of questions in the alternative semantics framework, and then I will explain the above-mentioned distributional properties of these questions.

I want to start from A-not-A questions. The problem is how such questions are interpreted, and what the LF of these questions is. Huang (1982a) discusses a proposal made by Wang (1967), which regard A-not-A questions as reduced alternative questions via the rule of Conjunction Reduction of Ross (1967). In this view, the question in (84) is reduced from (95) by multiple applications of the rule of Conjunction Reduction. But the question in (95) is an awkward sentence, bordering on ungrammatical. Of course, it does not necessarily have to be a SS sentence in the framework assumed by Wang (1967). It could very well be a DS sentence.

- (95) Zhangsan xihuan Lisi, haishi Zhangsan bu xihuan Lisi.
 Zhangsan like Lisi or Zhangsan not like Lisi
 Does Zhangsan like Lisi or does Zhangsan not like Lisi?

Huang (1982a) takes a more direct approach. He argues that the A-not-A part is similar to a wh-quantifier, and its domain of quantification consists of [A] and [not A]. Since wh-phrases in Mandarin move at LF in his theory, we can assume that the A-not-A part also moves. Thus the LF of A-not-A questions can be represented as:

- (96) [_{S'} [_{comp} For which x; x a [[A], [not A]]] [_S ...x...]]

The LF in (96) is similar to the LF of wh-questions. As I have noted in 2.2, such LF's can be interpreted semantically by the rules given in Lahiri (2002). However, there are some crucial differences between wh-questions and A-not-A questions. For one thing, the A-not-A part is a verbal structure, and traces are normally interpreted as of type e. Thus the movement of A-not-A has to use some special mechanism to interpret the “left-over” structure in S. Presumably this is not a technical problem, and it is possible to come up with a special compositional semantics for such structures. But we might wonder if there is a simpler way of interpreting such questions without resorting to either LF movement or *ad hoc* special compositional rules. What we need is a combination of Huang's (1982a) insight and the Alternative Semantics theory.

Huang's (1982a) approach is essentially correct in that there is no conjunction reduction and the A-not-A part contributes directly a domain of restriction. Now recall that in the Alternative Semantics theory, in wh-questions, the wh-phrases contribute a set of individual alternatives, while the verb contributes a singleton set of functions. In A-not-A questions, the situation is reversed. The verbal complex A-not-A yields a set of functions, and the relative DPs denote a singleton set of individuals. Thus the denotation of *xi-bu-xihuan* is (97). As usual the DPs *Zhangsan* and *Lisi* denote a singleton set of individuals respectively, i.e. {z} and {l}.

$$(97) \llbracket xi-bu-xihuan \rrbracket^{w,g} = \{ \lambda x. \lambda y. \lambda w'. like(x)(y)(w'); \\ \lambda x. \lambda y. \lambda w'. \neg like(x)(y)(w') \}$$

Now we can make use of the same Image Construction Functional Application rule to interpret the A-not-A question in (84). For example:

(98) Sample derivation of A-not-A question

$$\begin{aligned}
& \llbracket \text{Zhangsan xi-bu-xihuan Lisi} \rrbracket^{w,g} \\
&= \llbracket \text{xi-bu-xihuan} \rrbracket^{w,g} \llbracket \text{Zhangsan} \rrbracket^{w,g} \llbracket \text{Lisi} \rrbracket^{w,g} \\
&= \{ (f(x))(y): f \in \llbracket \text{xibuxihuan} \rrbracket^{w,g} \ \& \ x \in \llbracket \text{Lisi} \rrbracket^{w,g} \ \& \ y \in \llbracket \text{Zhangsan} \rrbracket^{w,g} \} \\
&= \{ (f(x))(y): f \in \{ \lambda x. \lambda y. \lambda w'. \text{like}(x)(y)(w'); \lambda x. \lambda y. \lambda w'. \neg \text{like}(x)(y)(w') \} \\
&\quad \& \ x \in \{1\} \ \& \ y \in \{z\} \} \\
&= \{ \lambda w'. \text{like}(1)(z)(w'); \lambda x. \lambda y. \lambda w'. \neg \text{like}(1)(z)(w') \}
\end{aligned}$$

Again the derivation of (98) is essentially the same as wh-questions. Another point that this derivation shows is that no question particle is necessary. The semantics itself yields a question denotation. On the other hand, the sentential particle *–ne* is compatible with A-not-A questions, as is the case with wh-questions. For example:

(99) Zhangsan xi-bu-xihuan Lisi ne?

Zhangsan like-not-like Lisi PAR

Does Zhangsan like Lisi?

I have shown that this sentential particle *–ne* does not contribute to the question meaning. Thus the difference with or without this particle does not lie in the interrogative meaning itself, but should be sought elsewhere in the grammar. The compatibility of the particle *–ne* with A-not-A questions is also further support for my claim that the particle *–ne* is not a wh-question particle as assumed by Cheng (1991). If it were a wh-question particle, it should not be compatible with A-not-A questions, since there is no wh-variable to bind in A-not-A questions.

I have argued that the A-not-A questions involve alternatives on the verb level. Now I want to mention briefly a special type of verbal “how” questions. These are questions such as:

(100) Zhangsan zenme-le Lisi?

Zhangsan how-PRF Lisi

What did Zhangsan do to Lisi?

In such questions, a wh-question is formed based on the position of the main verb. Thus such a verbal “how” can be argued to contribute a set of functions. The denotation of this verbal *zenme* in Mandarin can be (101):

$$(101) \llbracket zenme \rrbracket^{w,g} = \{f: f \in D_{\langle s, \langle e, \langle e, t \rangle \rangle \rangle}\}$$

The use of such verbal *zenme* questions restricts the set of two-place functions in (101) to certain types of verbs that are contextually salient. For example, it could be a set of verbs like {hit, kick, slap, ...} in relevant contexts. I will not go into any detailed semantic analysis of such verbal “how” questions in this chapter. A comprehensive explanation of such questions will be given in Chapter 6.

Recall that I have shown earlier that A-not-A questions cannot be embedded. Now the question is whether the semantics given in (97) and (98) can account for this phenomenon. Actually it is indeed predicted by the Alternative Semantics to be unacceptable. First let’s consider the case of (89) in which an A-not-A question is embedded as an object clause. According to the Alternative Semantics, if the A-not-A keeps expanding to the matrix clause, then we get the following alternative set:

$$(102) \{ \wedge \text{know}(z, \wedge \text{like}(l, m)); \\ \wedge \text{know}(z, \wedge \neg \text{like}(l, m)) \}$$

Although in terms of question denotations, there is no requirement as to what formal resemblance the set of alternatives in the answer set should have, some alternative sets can be expressed as a question, and some cannot. Recall the denotation of a polarity question: $\{p; \neg p\}$. A-not-A questions have the same denotation. But in the alternative set in (102), the two alternatives are not in the form of $\{p; \neg p\}$, because:

$$(103) \wedge \text{know}(z, \wedge \neg \text{like}(l, m)) \neq \wedge \neg \text{know}(z, \wedge \text{like}(l, m))$$

Therefore the above alternative set is *not* expressible as a polarity question or an A-not-A question. In fact, it is not expressible as a question at all. Therefore such an embedded A-not-A question receives two question marks. The semantic derivation goes through, but the final product fails to be expressible as a question.

Now if an embedded A-not-A question is needed, they have to be changed into a whether-question in Mandarin with the *shi-bu-shi* (“be-not-be”) operator as the complementizer, e.g.:

(104) Zhangsan zhidao Lisi shi-bu-shi xihuan Mary.

Zhangsan know Lisi be-not-be like Mary

Zhangsan knows whether Lisi likes Mary.

The *shi-bu-shi* operator yields a set of alternatives that cannot expand beyond its immediate containing CP. The semantics of this operator is to take a proposition and turn it into a polarity question in an embedded clause, i.e.:

$$(105) \llbracket shi\text{-}bu\text{-}shi\ p \rrbracket = \{p, \neg p\}$$

Now what about examples like (92) and (93) in which an A-not-A or an alternative question is embedded as a sentential subject and these sentences are grammatical. I have pointed out that whether or not these are genuine cases of sentential subjects is still debatable and not very clear to me. On the other hand, the semantics for the object clause as I have just sketched above should apply here too and renders the subject clause unacceptable. But that's not the case. Why? In fact the answer lies in the semantics of the overt *wulun* operator which has been omitted from the previous examples. In the subject-clause A-not-A questions, there is an equivalent way of expressing the same idea, i.e. *wulun...A-not-A,...dou* ("no matter ..., ..."). For example:

- (106) *Wulun Zhangsan xi-bu-xihuan Lisi dou gen wo meiyou guanxi.*
 No-matter Zhangsan like-not-like Lisi all with me not-have relation
 No matter Zhangsan likes or doesn't like Lisi, it's none of my business.

This *wulun* operator can be omitted sometimes, and in such cases it can be added back without affecting the meaning of the sentence. Thus it can be assumed that the *wulun* operator is always there and it is an overt operator. When the context is clear, the *wulun* can be dropped freely. Apparently the word *wulun* is an overt operator that can close the set of alternatives that are contributed by the A-not-A. Lin (1996) studies such *wulun...dou* constructions in Mandarin, and gives the following semantics for *wulun*:

(107) Lin's (1996) semantics for the *wulun* operator:

"I propose that the function of *wulun* is to form the generalized union over the set of propositions, i.e., the set of sets of situations, denoted by the wh-clause following it. The generalized union over a set of propositions is defined as follows.

(39) Let A be any set of propositions²⁶

$$\cup A = \{s: \exists p (p \in A) \ \& \ s \in p\}"$$

We see that *wulun* is equivalent to the propositional universal quantifier in the Alternative Semantics. Thus in embedded subject clauses of A-not-A questions, there is always a *wulun* to universally close the set. It will never expand beyond the embedded clause. In contrast, in the object clause cases, there is no overt operator to close the set, and therefore the A-not-A just keeps expanding, and then it derives an inexpressible alternative set. Recall that an embedded wh-question can be closed by a covert existential quantifier. Then we must assume that A-not-A questions always need an overt quantifier to either universally or existentially close the set. The operator *shi-bu-shi* is just one of such over quantifiers. I have shown that the Alternative Semantics can account for asymmetry of embedding in A-not-A questions, but the same goes with alternative questions, as can be seen from the semantics given later in this section. I will not go into any further detail here.

There is one more issue I want to address briefly before moving on to polarity questions. What is the scope of A-not-A relative to other quantifiers, e.g. *every*? In the following English example, both scope relations between "every" and "or" are possible:

²⁶ The reference number is the original one in Lin's (1996) book.

(108) Is every procedure strictly legal or illegal?

(i) For each procedure, is it legal or illegal?

(ii) For all of the procedures, are they legal or illegal?

What is the situation in Mandarin A-not-A questions? Does alternative semantics predict the scope relations? An equivalent example in Mandarin would be:

(109) *Meigeren dou xi-bu-xihuan Lisi?*

Everyone all like-not-like Lisi

(i) For each person, does he like or not like Lisi?

(ii) *Does everyone like Lisi?

Unlike in English, here in Mandarin only the first reading is available. This is actually in line with the general observation that quantifier/question scope in Mandarin is fixed in surface syntax, i.e. the linear order of the QPs reflects their scope relations. In terms of the Alternative Semantics, it predicts that only the first reading is available. Let's assume with Lin (1998) that *meigeren* in Mandarin is not a generalized quantifier like "everyone" in English, but contributes a set of individual alternatives. Suppose we have the individual set {a, b, c}, and then if we apply the alternative semantics, we get the following:

(110) {like(a,l); ¬like(a,l);

like(b,l); ¬like(b,l);

like(c,l); ¬like(c,l)}

Now any consistent subset of this set of alternatives is a good answer to the question. If it happens that the true answer set comprises the left column of the alternative set, then we get a reading which corresponds to an answer to the reversed-scope question reading. But this might be just a special case of the first reading. Thus I conclude this part of the discussion by saying that the A-not-A operator cannot scope over other quantifiers, and the reversed-scope reading can be derived as a special case of the narrow-scope reading.

Next I want to look at polarity questions. I will first point out the similarity between a polarity question and a special type of A-not-A question in some dialects of Mandarin. The type of A-not-A questions I have discussed above is the most common type. In many dialects, there is a related form. The following question is equivalent to the A-not-A question in (84).

(111) Zhangsan xihuan Lisi bu ?

Zhangsan like Lisi not

Does Zhangsan xihuan Lisi ?

The imperfective negation *bu* appears at the end of the sentence, which makes it look more like a sentential particle. There are two different negation words in Mandarin: the imperfective *bu*, and the perfective *mei*. The imperfective *bu* can be translated as “do not”, and the perfective *mei* as “did not”. It is also possible to have the perfective negation *mei* in this construction. For example:

(112) Zhangsan chi fan le mei ?

Zhangsan eat meal PRF not

Did Zhangsan eat?

One possible explanation for this type of questions is that they are essentially the same as A-not-A questions, in that they are elliptical forms of VO-not-VO. If the second VO is deleted, then we get the form “VO-not”. Therefore the VO-not-VO form is comparable to A-not-A, and the difference is that what is repeated in the VO-not-VO form is not simply a verb, but a verb-object constituent. Since the VO-not-VO form is always almost ungrammatical, I assume that there is an intermediate form VO-not-V, in which the repeated object is deleted. Such sentences are more or less acceptable. Thus corresponding to the form in (111) and (112) we also have the VO-not forms as in (113) and (114) respectively.

(113) Zhangsan xihuan Lisi bu xihuan?

Zhangsan like Lisi not like Lisi

Does Zhangsan like Lisi

(114) Zhangsan chi fan le mei chi?

Zhangsan eat meal PRF not eat

Did Zhangsan eat?

Such similarity does not necessarily mean that the VO-not form is indeed derived from the VO-not-V form. But this similarity can help us understand the semantic interpretation of the VO-not form. I will argue that these VO-not forms have the same semantic contribution as the A-not-A form, i.e. they contribute a set of functions. The only difference between these two forms is the domain on which the function is formed, i.e. V in the A-not-A form and VP in the VO-not form.²⁷ In fact the VO-not form should correspond to the predicate of the sentence. Thus the

²⁷ As in the A-not-A questions, adjectives and prepositions, but not nouns, are good in this construction.

denotation of *xihuan Lisi bu* in (111) should be (115), and the rest of the derivation is the same as in the derivation of (98):

$$(115) \llbracket xihuan Lisi bu \rrbracket^{w,g} = \{ \lambda x. \lambda w'. like(Lisi)(x)(w'); \\ \lambda x. \lambda w'. \neg like(Lisi)(x)(w') \}$$

Now let's take a look at the similarity between the VO-not questions and polarity questions. By analogy, the question particle *–ma* is in the same position as the negation in the VO-not questions. I will argue that the particle *–ma* functions as a generic term of negation in place of the perfective *mei* and the imperfective *bu*. By “generic term of negation”, I mean that it can function as either a perfective or an imperfective negation word.

If the particle *–ma* is indeed a generic negation word, then we might expect cases where the functions of the imperfective negation *bu* and the perfective negation *mei* are confused or merged. Some evidence for the convergence of these two negations can be found in the following examples cited by Shao (1996).

(116) Ni ziji you ge jue ding bu? (Shao 1996: 112)

You self have CL decision not

Do you have a decision yourself?

The negation of the verb *you* (“have”) is *meiyou*, formed with the perfective *mei*, and **buyou* is ungrammatical. The use of the *bu* in the sentence final position in (116) shows that this *bu* takes the place of *mei*. This kind of questions is very common in certain dialects of Mandarin, e.g. the Beijing dialect. Shao (1996) also cites an

example from language acquisition. It is observed that there is a special type of VO-not question in children's questions. For example:

(117) Ni bu hui jiao bu?

You not can water not

Do you not know how to water the flowers?

In this case, the whole question is actually a polarity question, since in all “VO-not” forms, the first V cannot be negated. Here the imperfective *bu* takes the place of the normal *-ma* in polarity questions. This example shows that the function of the *bu* in the VO-not forms is similar to the function of the question particle *-ma*. It is indeed this functional similarity that causes confusion in children learning Mandarin.

More evidence can be found in some Chinese dialects. For example, Shao (1996: 113) mentions that the question particle [vA] in Shanghainese can be used to form a polarity question, and the function of this particle is similar to the Mandarin particle *-ma*. The origin of this particle is the combination of [və?] and [lA]. [və?] is the word for negation in Shanghainese, and [lA] is a sentential particle similar to the Mandarin sentential *-le*²⁸. This shows that it is a possibility that the question particle *-ma* comes from one of the negation words in Mandarin.

Thus I argue that the question particle *-ma* is not actually a sentential particle, but a generic form of negation as in the VO-not forms of questions, and this generic form of negation is attached to the predicate as in the VO-not forms. The syntactic structure of (118) is not (119) but rather (120)²⁹:

²⁸ This is not the aspect marker *-le*, although the forms of these two morphemes are the same.

²⁹ Note that I use the label VP, but not in the technical sense. It is only to indicate that the position of the attachment of the particle *-ma* is within the IP, but not above the IP in the C area.

(118) Zhangsan xihuan Lisi ma ?

Zhangsan like Lisi Q

Does Zhangsan like Lisi ?

(119) [_{CP} [_{IP} Zhangsan xihuan Lisi] ma]

(120) [Zhangsan [_{VP} xihuan Lisi ma]]

The advantage of this treatment of the particle *–ma* is that the particle is no longer in the C area³⁰. Recall that in the Unselective Binding theory, the question particle creates a possibility of LF movement of the whole IP, since the question particle indicates that the C is sentence-final. I have explained that the particle *–ne* is not a question particle. Suppose the particle *–ma* is a question particle, we might have to explain why it is sentence-final, possibly along the lines of LF movement. But in my proposal, this particle is no longer in the sentence-final position, and therefore the problem with LF movement does not arise. The other advantage of treating this particle *–ma* as directly contributing an alternative set is that we have a uniform way

³⁰ There is a potential problem for this proposal. If the particle *–ma* is a negation, then negative polarity questions need some special attention. For example:

- (i) Zhangsan bu xihuan Lisi ma?
Zhangsan not like Lisi Q
Does Zhangsan not like Lisi ?
- (ii) *Zhangsan bu xihuan Lisi bu ?
- (iii) *Zhangsan bu xi-bu-xihuan Lisi ?

There is no problem with the particle *–ma* in a negative polarity question, as shown in (i), but a negative VO-not question or a negative A-not-A question is not allowed, as shown in (ii) and (iii). This shows that at least there are some differences between polarity questions and the other two types. However, semantically speaking there is no problem with the first negation in (ii) and (iii), if we treat it as a sentential negation. Indeed the language acquisition example in (117) shows that there is no semantic or syntactic reason for excluding such question forms. Therefore it seems that the reason for this exclusion is that the two identical negation forms in (ii) and (iii), i.e. *bu*, should be avoided, while there are no such identical forms in a negative polarity question, since the particle *–ma* is different from either *bu* or *mei*. This indeed might even be further support for treating the particle *–ma* as a generic negation.

of forming questions in Mandarin, i.e. syntactically introducing alternatives, which contrasts with the English type of question forming strategy by quantification.

There might be another advantage of treating the particle *–ma* as a generic form of negation. I have shown in (99) that A-not-A questions are compatible with the particle *–ne*. Then what about the particle *–ma*? The following examples show that an A-not-A question is not compatible with the particle *–ma* in (121), just as an A-not-A question is not compatible with the VO-not form of questions shown in (122).

(121)*Zhangsan xi-bu-xihuan Lisi ma?

Zhangsan like-not-like Lisi Q³¹

Intended reading: does Zhang like Lisi?

(122)*Zhangsan xi-bu-xihuan Lisi bu?

Zhangsan like-not-like Lisi not

Intended reading: does Zhang like Lisi?

If as I have argued, the particle *–ma* is functionally similar to the negation in VO-not questions, then the parallel between (121) and (122) follows naturally³². There might

³¹ I will continue to use the symbol Q for *–ma*, since it has been a standard assumption in Chinese linguistics that this particle *–ma* is a question particle. Although I have made a totally different proposal, I will keep the most popular label.

³² There is another complication here. The VO-not questions are compatible with the particle *–ne*, although such sentences do not sound as natural as wh-questions with *–ne*. But polarity questions with the particle *–ma* is not compatible with *–ne*. For example:

- (i) Zhangsan xihuan Lisi bu *ne*?
Zhangsan xihuan Lisi not PAR
Does Zhangsan like Lisi ?
- (ii) *Zhangsan xihuan Lisi *ma ne*?
Zhangsan like Lisi Q PAR
Intended reading : does Zhangsan like Lisi ?

This might be due to the conflict between two sentential particles, i.e. *–le* and *–ne*. As I have mentioned, the polarity particle in Shanghainese is a combination of negation and the sentential particle *–le*. If the Mandarin *–ma* is also such a combination, then there might be a conflict between sentential particles.

be a semantic reason for the ungrammaticality in both of these examples above. The semantic contribution of the A-not-A part is a set of alternatives, as I have shown in (115), and when the particle *–ma* is applied to this set of alternatives, it is supposed to negate this set of alternatives, and create another set of alternatives. Then we get a set of sets of alternatives that has to be applied to the subject DP *Zhangsan*. There are two problems in this whole process. First, how does the negation of a set of alternatives work? Second, how can we apply a set of sets of alternatives to a singleton set of individuals, say {z} for *Zhangsan*. Before we figure out how the semantics should work in these two cases, it seems that the examples in (121) and (122) are simply not computable. In the LF movement analysis, the A-not-A operator moves to the same position as *–ma*, then there is a conflict. This might be how such examples are explained in the Quantificational theory. But in my analysis, such examples are simply excluded for semantic reasons, without having to resort to covert LF movement.

Now let's look at alternative questions in Mandarin. As has been shown above, the set of alternatives can be introduced on the verb level as in A-not-A questions, on the predicate level as in VO-not and polarity questions, or on the argument level as in argument wh-questions. There is at least one more possibility, i.e. on the IP level. This is exactly the case with alternative questions. Each alternative in an alternative question corresponds to one proposition in the Hamblin set. In cases where there are sub-sentential components in the disjunction, it can be argued that ellipsis is involved. For example:

(123) *Zhangsan xihuan Lisi haishi Mali?*

Zhangsan like Lisi or Mary

Does Zhangsan like Lisi or does Zhangsan like Mary?

(124) *Zhangsan xihuan Lisi haishi (Zhangsan xihuan) Mali?*

The LF of (123) is (124). In English, the direct translation of the structure in (123) is ambiguous between an alternative question and a polarity question. For example (125) can be interpreted as either a polarity question asking if you like something or an alternative question asking you to make a choice.

(125) Do you like coffee or tea?

But in Mandarin, these two readings have to be expressed differently. The conjunctive *haishi* is used to conjoin sentences, while there is a sub-sentential conjunctive *huozhe* which expresses disjunction as well. Only the sub-sentential *huozhe* is compatible with the polarity question marker *-ma*, as is shown in (126) and (127):

(126) *Zhangsan xihuan Lisi haishi Mali ma?

Zhangsan like Lisi or (sentential) Mary Q

Intended reading: Does Zhangsan like someone (either Lisi or Mary)?

(127) Zhangsan xihuan Lisi huozhe Mali ma?

Zhangsan like Lisi or (sub-sentential) Mary Q

Does Zhangsan like someone (either Lisi or Mary)?

The incompatibility of *haishi* and *-ma* shows that the arguments of *haishi* must be IPs, because (126) would not be ungrammatical if *haishi* can take simple DPs as arguments, just like *huozhe* in (127). Therefore all alternative questions involve alternatives on the sentence level, even if there might be sub-sentential components.

Now I have discussed all three types of non-wh questions. I would like to sum up the points that I made in this section. First, I argue that the A-not-A questions

involve an alternative set of functions. The A-not-A part translates directly into a binary set of functions which can then be composed into a Hamblin set of question denotation by Image Construction Functional Application. Second, I argue that polarity questions formed with the question particle *-ma* can be analyzed as a type of VO-not question. In such questions, the binary set of functions is formed on the predicate level. Thirdly, all alternative questions introduce alternatives directly on the sentence level.

Taking all these three points into consideration, I further argue that these are natural consequences of adopting the Alternative Semantics theory. First, the Alternative Semantics theory predicts that no question particle is needed if alternatives can be formed somehow, e.g. by wh-indefinites, and by A-not-A. The analysis of polarity questions as a special type of VO-not questions in Mandarin suggests that all question formation in Mandarin is by directly forming alternatives on different levels. Second, the original theory deals with alternatives on the argument level, i.e. argument wh-questions. I have shown here that the alternative set can be formed on different levels, i.e. argument, verb, predicate and sentence levels.

The points made in this section can be summarized as in Table 2.3.

Table 2.3: Mandarin questions in the Alternative Semantics

Q-type	<i>-ma</i>	<i>-ne</i>	Level of Alternative	Embedding	
				Object	subject
Polarity	✓	×	VP/AP	× ✓	×
VO-not	×	✓	VP/AP	× ✓	×
A-not-A	×	✓	V/Adj/Prep	×	✓
Alternative	×	✓	IP	×	✓
wh-argument	× ✓	✓	DP	✓	✓

In the next section, I will address the issue of scope-marking in wh-questions in terms of the Alternative Semantics theory. Since the scope marking problem has been accounted for by movement in the Quantificational theory and by the position of the Q morpheme in the Unselective Binding theory, we need a comparable way of marking the scope of a wh-phrase in the Alternative Semantics.

2.6 Scope Marking of Questions by Focus Accent

In this section, I will first introduce the scope-marking strategy in Japanese as proposed by Ishihara (2002). I will also argue that the evidence in Japanese shows that the question particle *-ka* functions as a scope-marker, instead of being a wh-binder as has been supposed in Shimoyama's (2001) work. I will show that the scope-marking strategy in Japanese is actually the use of question particles. The focus intonation as observed by Ishihara (2002) is not directly a scope-marking device. Based upon work by Ishihara (2002) on the scope marking of focus intonation in wh-questions in Japanese, I propose that the scope of wh-phrases in Mandarin is marked by phonological prominence. First I discuss matrix wh-questions. I argue that focus intonation in matrix wh-questions can be accounted for by the Relativized Stress-F constraint proposed by Rooth (2009). Then I discuss embedded wh-questions and the scope ambiguity discussed by Huang (1982a). I show that scope of the wh-question is marked by phonological prominence on the wh-pronoun. This kind of phonological marking of focus scope is the standard strategy in the Alternative Semantics of focus (Rooth 1985, 1992, 2009). Since the Alternative Semantics of wh-indefinites is an extension of the original Alternative Semantics, the convergence of these two theories in terms of the focusation of the wh-indefinites is only a natural consequence.

First, let's take a look at the scope marking strategy of Japanese wh-questions. Ishihara (2002) observes that a special focus intonation has to be realized within the domain of a wh-word. For example:

(128) Naoya-ga nani-o nomiya-de nonda **no**?

Naoya-Nom what-Acc bar-Loc drank Q

What did Naoya drink at the bar?

(129) Naoya-wa [Mari-ga nani-o nomiya-de nonda **ka**]

Naoya-Top Mary-Nom what-Acc bar-Loc drank Q

Yumi-ni morasita.

Yumi-Dat divulged

Naoya divulged to Yumi what Mary drank at the bar.

(130) Naoya-wa [Mari-ga nani-o nomiya-de nonda to]

Naoya-Top Mary-Nom what-Acc bar-Loc drank that

Yumi-ni morasita **no**?

Yumi-Dat divulged Q

What did Naoya divulge to Yumi that Mari drank at the bar ?

In the matrix wh-question in (128), the F0 peak of *nani* is boosted, shown by the box around it and the F0 of the rest of the sentence after the wh-word is reduced, shown by the underline. This conclusion is drawn by comparison between this wh-question and a normal declarative, where there is no F0 boost or reduction. In the embedded questions in (129) and (130), the F0 peak of the wh-word is still boosted, while the F0 reduction stops at the question particle. If the question particle is embedded, then the F0 reduction stops there and after that the normal pattern of F0 is observed and there is

a pickup of F0 due to the previously reduced F0 within the scope of the question. If it is a matrix question, then the F0 reduction continues to the end of the sentence.

Ishihara (2002) draws the following conclusion from such data. There is a match between the focus intonation on wh-words and their scope, i.e. the wh-words must have the highest F0 peak in the scope of the question reading. Thus it seems that the scope marking strategy is carried out jointly by the focus intonation and the question particle. However, more recently, Ishihara (2006) noticed a *mismatch* between the focus intonation and the scope of questions in scrambling cases. For example:

- (131) Nani-o Naoya-wa [Mari-ga t nomiya-de nonda ka]
 What-Acc Naoya-Top Mary-Nom bar-Loc drank Q
imademo oboeteru.
 Even.now remember
 Naoya still remembers what Mary drank t at the bar.

The wh-question in (131) is essentially the same as (129), except that the wh-word *nani* is scrambled to a position in the matrix clause. But the scope of the question is still an embedded clause, due to the embedded question particle *-ka*. If there is a match between focus intonation on the wh-word and its scope as seen before, then the F0 reduction should stop at the embedded question particle. But according to experimental data, the F0 reduction continues to the end of the whole sentence.

Thus this mismatch is strong evidence that the focus intonation and the function of the question particle are not necessarily the same things. Although in some cases the functions of these elements converge, as in the non-scrambling cases in Japanese, in some cases they do not, as in the scrambling cases. What the data suggest

here is that the question particles in Japanese mark the scope of a question, while the focus intonation is related to the realization of the focus feature carried by the wh-word. They belong to different components of the grammar. This is further support that the question particles in Japanese are actually not wh-binders, but rather scope-markers. If this is true, then it explains why these question particles are optional in matrix questions. In terms of the theory of questions, then there is no need to give a special meaning to these question particles in the Alternative Semantics of questions. One difference between the version without the particle and the version with the particle is that the question particles in matrix wh-questions make the question sound more polite, but without these particles these wh-questions are still questions³³. Furthermore as I have mentioned previously, Hagstrom (2001) also reports that the question particle in Japanese is optional in wh-questions (see example (80)). Hagstrom (2001) mentions the co-occurrence requirement of question particles with *ittai* (“in the world, on earth”). For example:

- (132) ??Hiro-ga ittai nani-o tebeta?
Hiro-Nom ittai what-Acc ate
Intended reading: what in the world did Hiro eat?

Although the question particle is normally optional, it is required when the question contains *ittai* as shown in (132). This is actually very similar to the situation in Mandarin, where the question particle *-ne* is normally optional, but preferred in a wh-question with *jiujing*, *daodai*, and etc. These words can be translated as “in the world” or “on earth”. Thus cross-linguistic evidence and the mismatch of scope marking in

³³ Takae Tsujioka, *p.c.*

Japanese seem to show that the main function of the question particle in Japanese is to mark the scope of an indeterminate phrase instead of being a wh-binder.

Now let us look at the scope marking strategy in Mandarin. Ishihara (2002) points out the scope marking by focus intonation and by question particles in Japanese. It is actually the question particle that is the main scope marker in Japanese. In Mandarin, no question particle is needed in a wh-question, and such particles can not be embedded. Thus the only possibility of scope marking in Mandarin has to be focus intonation. I will argue that this is indeed the case.

I will start from the simplest cases in matrix wh-questions. Normally, the wh-pronoun has to be the most prominent phonologically. For example:

(133) Zhangsan xihuan **SHEI**?

Zhangsan like who

Who does Zhangsan like?

(134)? Zhangsan **XIHUAN** shei?

Zhangsan like who

Intended reading: Who does Zhangsan like?

In (133), the wh-pronoun is the most prominent, with the prominence indicated by the bold letters. This is the normal intonation for a wh-question. If the wh-pronoun is not accented at all, and instead the verb is the most prominent as shown in (134), it is very hard to get the normal question reading. Such intonation patterns are in fact the standard intonation for the existential readings of wh-indefinites in Mandarin, which is the subject matter for Chapter 3. But such existential readings need a licenser, such as modal adverbs *dagai* (“probably”) and the inferential sentential particle *-le*. Since there is no such licenser in (134), it is very difficult to interpret the wh-pronoun as

existential. That is why this sentence sounds very odd³⁴. Thus the following seems to be a good generalization of Mandarin wh-question intonation.

(135) Wh-pronouns are the most prominent phonologically in matrix wh-questions.

Now the task is to figure out how this phonological prominence is derived and what we mean by saying that the prominence marks the scope of a wh-question.

Haida (2008) proposes that all wh-pronouns have a focus feature, based on cross-linguistic work on the focusation of wh-pronouns. For example, É Kiss (1991) shows that a wh-phrase other than *miért* “why” is always in the preverbal focus position in Hungarian. The following paradigm is taken from Haida (2008).

- (136)a. A huzat [melyik szoba ablakait] törté be?
The draft which room’s windows.Acc broke in
The windows of which room did the draft break?
- b. [Melyik szoba ablakait] törté be a huzat?
- c. *A huzat [melyik szoba ablakait] be törté?
- d. *[Melyik szoba ablakait] be törté a huzat?
- e. *[Melyik szoba ablakait] a huzat be törté?
- f. *[Melyik szoba ablakait] a huzat törté be?

The preverbal position is a syntactic position for focus. The examples above show that if the wh-phrase is immediately in front of the main verb, the sentence is good.

³⁴ But this sentence can be a follow up question to clarify that the speaker cares about who Zhangsan likes, but not who Zhangsan admires. Such questions contain a second-occurrence focus on the wh-pronoun, and I will talk about such second-occurrence wh-pronouns shortly.

Otherwise the sentence is not grammatical. This is strong evidence that in Hungarian a wh-phrase is focused and marked syntactically. Haida (2008) gives examples from other languages such as Japanese and German, where different focus marking strategies are taken, although the wh-phrases are always marked. Therefore it seems that there is a correlation between wh-in-situ and focus. Now in light of this cross-linguistic generalization, I will assume that all wh-pronouns in Mandarin are marked with a focus feature.

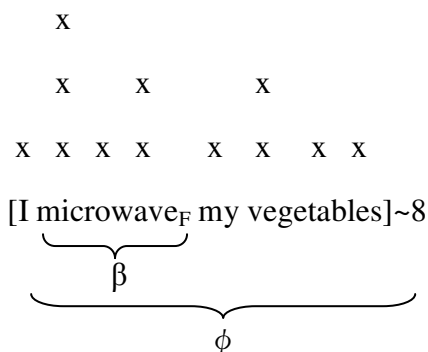
On the other hand, Truckenbrodt (1995) notices the domain of phonological prominence and the domain of the focus are the same. He observes that a focused phrase is always prosodically the most prominent within the domain of the focus. Thus he proposes a Stress F constraint. Rooth (2009) formulates this constraint as:

(137) Stress F

Let β be an F-marked phrase with scope ϕ . Then the strongest stress in the phonological realization of ϕ falls within the realization of β .

Rooth (2009) gives the following examples to illustrate this constraint.

(138) [you boil your vegetables]₈



In some sense, the first sentence in (138) is the antecedent for the focus in the second sentence. The “~” operator marks the scope of the focus, and the indexing indicates the antecedent. Thus according to the Stress F constraint, the focused word “microwave” has to be the most prominent in its scope, which is the whole sentence. Phonological prominence is marked here with the metrical grid above the sentence.

One way of conceptualizing this constraint is in terms of the “projection” of a focus. In Rooth’s (2009) system, he introduces two directional operators: *l* and *r*. The *l* operator indicates that the left daughter node is where the focus projects, and correspondingly the *r* operator indicates that the right daughter node is where the focus projects. In simple cases where there is just one focus in a sentence, such directional operators are not necessarily needed. But in more complicated cases such as second-occurrence focus where there are two focus features, the directional operators can keep track of the path of focus projection and avoid a conflict of focus features. For now let’s use this more complicated notation for a simple example:

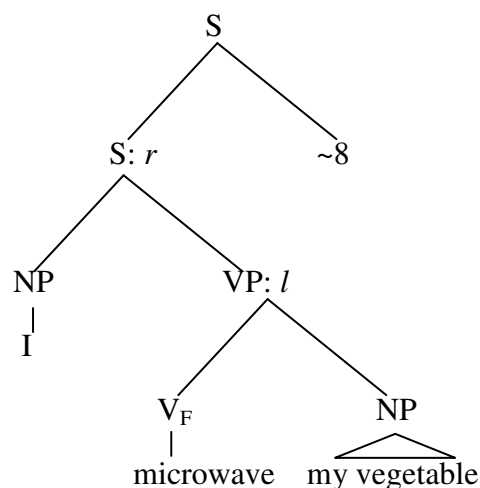


Figure 2.4: Focus projection in Rooth’s (2009) system

The focus feature *F* on the verb projects to the VP, which is labeled with the operator *l* which indicates that the left daughter node is more prominent. The *F* feature then projects to S, which is marked with the operator *r*, which indicates that the right daughter node is more prominent. The projection stops at the “~” operator, where the scope of the focus is reached and the focus semantic value is used. The local directional operators determine where phonological prominence is realized in the local scope. By recursive application of this phonological rule, we get the correct phonological prominence on the main verb. To be more specific, we can start from the scope of the focus, which is the lower S. According to the *r* operator, the right daughter node should be more prominent. Then at the VP level, the *l* operator indicates that the left daughter node is more prominent. Finally the prominence falls on the verb. The Alternative Semantics derive the focus semantics of the sentence, and there is a parallel focus projection process which determines the phonological prominence of the focused phrase. The mechanism proposed by Rooth (2009) captures this homomorphism between semantics and phonology. Since we have applied the Alternative Semantics theory to *wh*-in-situ, it follows naturally that the same kind of system proposed by Rooth (2009) can be used to account for the phonological patterns in *wh*-questions in Mandarin.

Now by combining Haida’s (2008) proposal of focus marking on *wh*-pronouns with Rooth’s (2009) focus projection mechanism, we can get the right parallel derivation of a simple matrix *wh*-question in Mandarin. The basic idea is that phonological prominence on the *wh*-pronoun is simply a result of focus feature projection. In Figure 2.4, it is the focus feature on the main verb that is projected, while in *wh*-questions it is the focus feature on the *wh*-pronoun in the argument

position that is projected. For example the focus feature projection process in the question in (133) can be represented as:

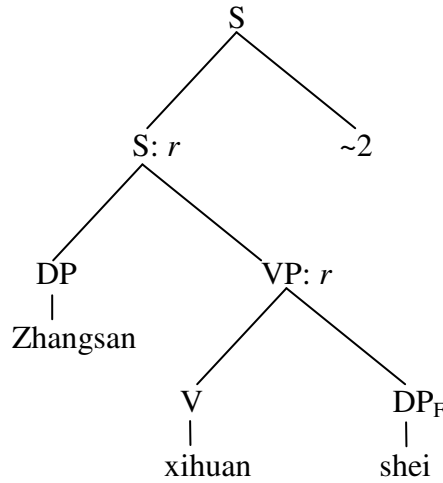


Figure 2.5: Focus projection in wh-questions

In syntactic terms, the F feature keeps projecting until it reaches the “~” operator. In semantic terms, as argued by Shimoyama (2001), the set of alternatives just keeps expanding until they reach a binder, which in this case is the “~” operator³⁵. Thus the feature projection process and the alternative expansion process are in fact the same process. In phonological terms, by recursive interpretation of the local operators *r* and *l*, phonological prominence is realized on the wh-pronoun. Finally the “~” operator and the index 2 are where the focus semantic value of a sentence is utilized. Note that the “~” requires a focus semantic value, or equivalently a set of alternatives, as its argument. Thus if the focus feature does not project all the way up,

³⁵ Note this “~” operator is not the same as the wh-binder in the Alternative Semantics of wh-questions. This “~” operator is a scope marker, which does not contribute to the question meaning. As I argued above, the question particles in Japanese mainly mark the scope of questions. In this sense, they are similar to this “~” operator. This is consistent in saying that the question particles in Japanese are not actually wh-binders.

and if there is no operator like *l* or *r*, the whole derivation will simply be uninterpretable.

There is a similar system proposed by Beck (2006) where wh-pronouns do not have an ordinary semantic value, contra Rooth (1985). The ordinary semantics of a constituent containing a wh-pronoun is undefined. It only has a focus semantic value. Figure 2.6 is a sample derivation in Beck's (2006) system.

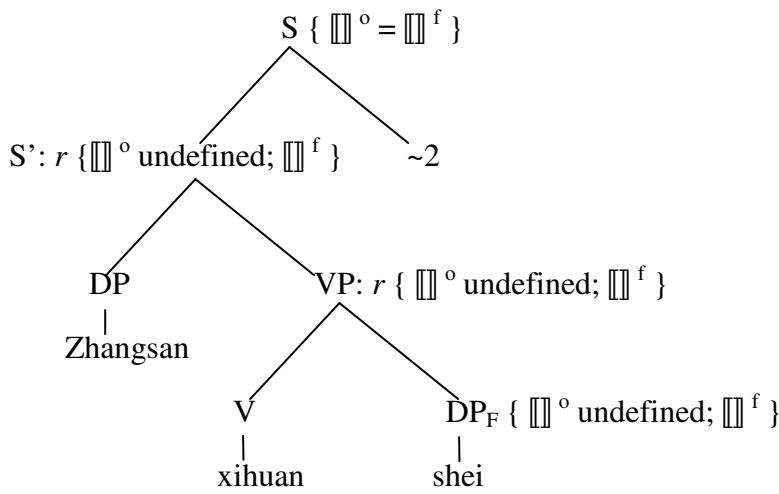
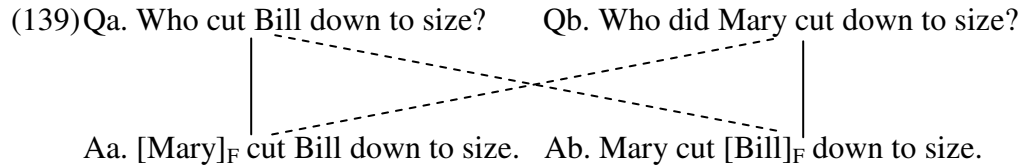


Figure 2.6: Focus projection in Beck's (2006) system

In this derivation, for each node containing a wh-phrase below the \sim operator, there is an undefined ordinary semantic value and a focus semantic value. Both values project upward. At the level of the S' , the focus semantic value is used by the \sim operator. According to Beck (2006), “the semantics of Q lets it ignore the ordinary semantic value of its sister, and elevate its focus semantic value to the ordinary semantics”. Thus if we assume that the \sim operator simply turns the focus semantic value into the ordinary semantic value, then the derivation is successful. This whole process is indeed very similar to Rooth's (2009) system, although Beck's (2006)

system might not be able to account for more complicated cases such as second-occurrence focus.

In terms of questions, the focus semantic value is used to derive question-answer congruence. Rooth (1992) gives the following example on question-answer congruence.



Aa is a proper answer to Qa, but not to Qb; Ab is a proper answer to Qb, but not to Qa. The explanation lies in the question-answer congruence constraint. First the focus semantic value of Aa and Ab is (140) and (141) respectively, while the question semantics of Qa and Qb are (142) and (143):

$$(140) \{ \text{cut-down-to-size}(x, b) \mid x \in E \}$$

$$(141) \{ \text{cut-down-to-size}(m, y) \mid y \in E \}$$

$$(142) \{ \text{cut-down-to-size}(x, b) \mid x \in E \wedge \text{person}(x) \}$$

$$(143) \{ \text{cut-down-to-size}(m, y) \mid y \in E \wedge \text{person}(y) \}$$

The letter E represents the set of individuals. Therefore clearly (142) is a proper subset of (140), and (143) is a proper subset of (141). In general, the question-answer congruence constraint is that the semantic value of the question is a proper subset of the focus semantic value of the answer. In Rooth (1992), the semantic value of a question is its ordinary semantic value. Thus the question-answer congruence can be

formulized in a uniform way with other focus phenomena by saying that the ordinary semantic value of the antecedent clause is an element or a subset of the focus semantic value of the focused sentence. In terms of questions, it amounts to saying that the ordinary semantic value of questions is a subset of the focus semantic value of the corresponding answer. However this version of the constraint cannot be used here, because we see that wh-pronouns are focused and questions should have a focus semantic value. The \sim operator on the question should also be factored into the question-answer congruence constraint. Here I will follow Beck's (2006) proposal that wh-questions only have a focus semantic value. Their ordinary semantic value is undefined. Now we can formulize a new constraint, making reference to both the focus semantic value of the question and of the answer.

(144) Question-Answer Congruence

A question-answer pair is cross-indexed with each other. The focus semantic value of the question is a subset of the focus semantic value of the answer.

To be more specific, we can give an example of the focus semantics of question and answer based upon the example in (138). Suppose we have the following pair of sentences.

(145) Q: [Zhangsan xihuan **shei**_F]₅~2

A: [Zhangsan xihuan **Lisi**_F]₂~5

When the \sim operator and index on the wh-question are interpreted, the \sim contributes a set of alternatives, and the index links this alternative set with the corresponding

answer. When the focus semantic value of the answer is used, again the \sim operator contributes a set of alternatives, and the index links this value to its antecedent. If the focus semantic value of p_2 is a subset of the focus semantic value of p_5 , then it is a valid question-answer pair.

Now I have shown how the phonological prominence is derived. What I mean by saying that the focus intonation marks the scope of a wh-question in Mandarin is that focus intonation is the only cue to where the “ \sim ” operator is located, since there is no overt particle to mark the scope of questions in Mandarin.

However, in some cases, the wh-pronoun does not have to be the most prominent. This is when another DP is marked with the main accent. For example:

(146) **ZHANGSAN** xihuan **SHEI**?

Zhangsan like who

Who does ZHANGSAN like?

In (146), the DP “Zhangsan” is the most prominent, while the wh-pronoun “shei” is not as prominent, although it is still prominent in a way as to be distinguished from a non-accented existential reading. Such sentences are used most naturally as a clarification question following another question. For example, if I asked who Zhangsan likes, and you answered that Lisi likes Mary, then I can use the question in (146) to clarify that I asked about Zhangsan, but not about Lisi. Phonologically speaking, this example seems to contradict the generalization in (135) and the Stress F constraint, since the wh-pronoun is not the most prominent. Then it also seems to contradict my claim that it is the phonological prominence that marks the scope of the wh-question in Mandarin. Since in (146), the wh-pronoun is not the most prominent in the whole sentence, should we say that it shows that the wh-pronoun has a scope

smaller than the sentence? Then how can we interpret it as a matrix question? I will show that we may treat the focus on the wh-pronoun as a second-occurrence focus (SOF), and in some sense it is indeed the most prominent in the whole sentence.

First, let us see the phonological pattern of SOFs. Rooth (2009) gives the following example for SOF:

(147) You know what? You only introduced Mona to Bobby_F yesterday.

You also only introduced Ashley_F to Bobby_{SOF} yesterday.

The first instance of the word “Bobby” is the most prominent in the whole sentence, since it is the only focused element. However the second occurrence of “Bobby” is less prominent than “Ashley”, because “Ashley” is the main focus of that sentence, and it is associated with “also” which has a wider scope than the adverb “only” that “Bobby” is associated with. Rooth (2009) cites recent experimental studies³⁶ on SOFs and claims that SOF is phonologically prominent, though not marked with a pitch accent. Thus the SOF “Bobby” is also phonologically prominent. However when we try to apply Stress F using the focus projection procedure given in Figure 2.5, there will be a conflict between the two F features, as shown in Figure 2.7. According to the focus projection procedure, both of the F features on the NP “Ashley” and the NP “Bobby” should project upwards. Then they share the same VP node, or put in an equivalent way, the same scope, which is the VP. Then according to Stress F, both

³⁶ For example, Beaver et al. 2007; Howell 2007. Rooth (2009) also cites additional evidence from weak pronouns (Beaver et al. 2007, von Stechow 1994, Rooth 1996).

- (i) He likes_{er} = He likes her.
- (ii) Mary’s boyfriend only likes HER. #Even her BOSS only likes_{er}.

In (ii), the second occurrence of “her” cannot be weakened, thus indicating a certain degree of phonological prominence.

daughter nodes should be stronger than any other node in the scope. This leads to a conflict and then no F feature can project anymore.

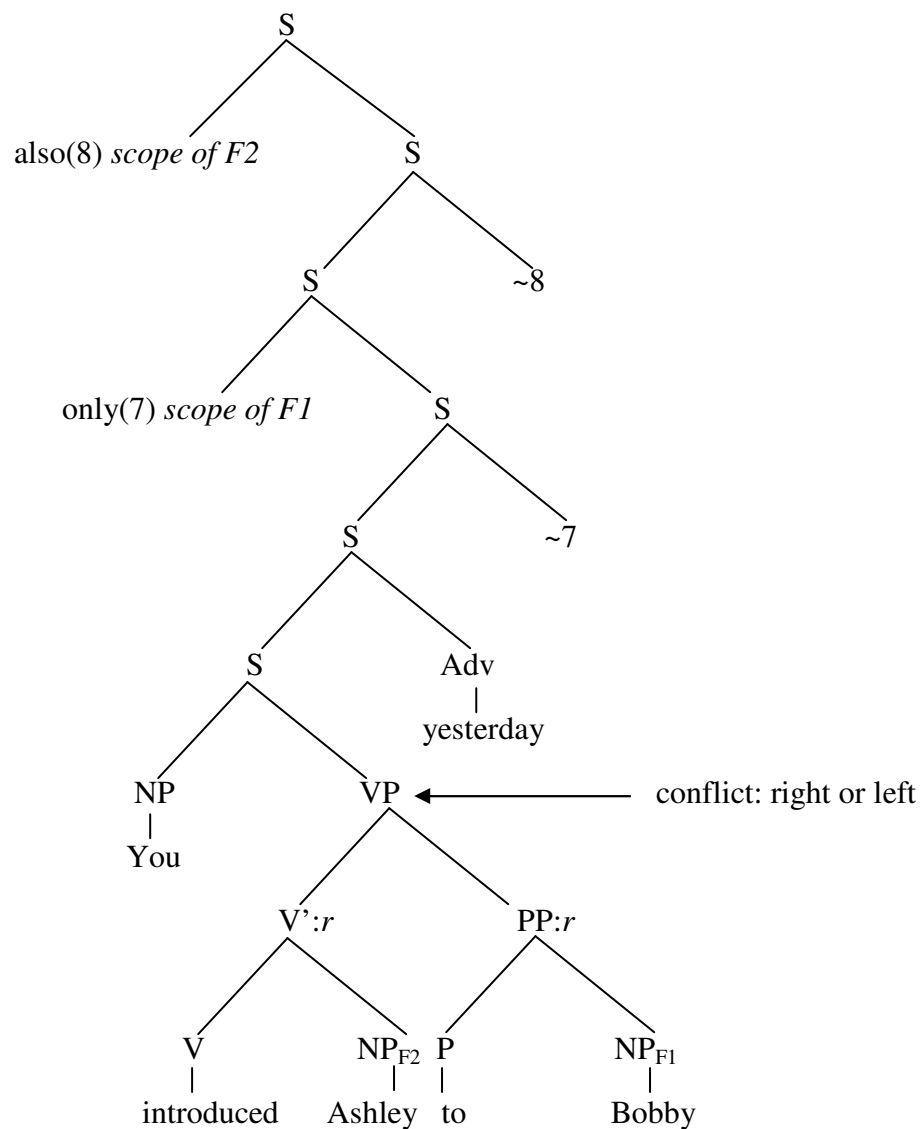


Figure 2.7: Conflict of two focus features in second-occurrence cases

Despite this projection conflict, sentences with SOFs are indeed perfectly interpretable sentences. Therefore we need a new formulation of phonological

prominence to cover SOF cases. Rooth (2009) proposes the following Relativized Stress-F constraint.

(148) Relativized Stress-F

Let β be an F-marked phrase with scope ϕ . Then the strongest stress in the phonological interval corresponding to β is strictly stronger than any stress in the phonological interval corresponding to ϕ which is not contained in the phonological interval corresponding to an F-marked subconstituent of ϕ whose scope is at least ϕ .

The above constraint is rather complicated in the way it is stated. Simply put, it says when assigning phonological prominence to a narrow scope focus, ignore the wide scope focus. Therefore in the example (147), when assigning phonological prominence, nothing is ignored, and the focused element “Ashley” receives the strongest accent. Therefore it is more phonologically prominent than the NP “Bobby”. Next, when assigning phonological prominence to the narrow scope SOF, temporarily ignore the NP “Ashley”, and then the NP “Bobby” is stronger than any other words except the NP “Ashley”. Therefore we get the desired phonological prominence patterns.

Derivationally, Rooth (2009) uses a system of localized directional operator as I have mentioned earlier. Figure 2.8 is a sample derivation of the second sentence in (147). First, each node is labeled with the numbers 1 and 2, which represent SOF and F respectively. Then the directional operators correspond to the numbers in the same order. Thus “2,1:l” means the F of the left daughter node projects, while the SOF of the right daughter node also projects.

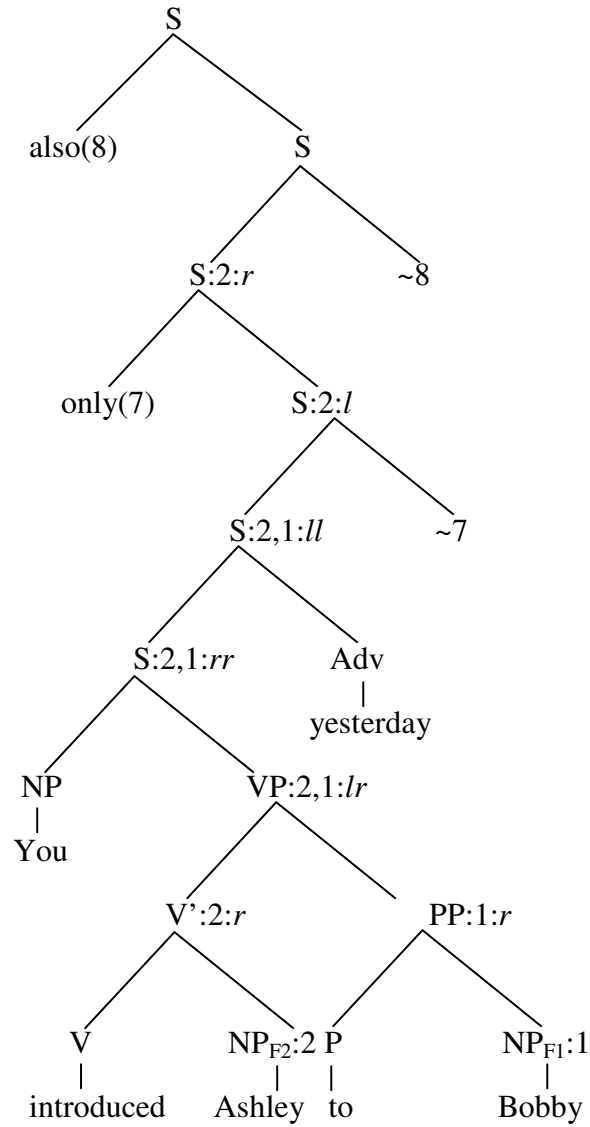


Figure 2.8: Sample derivation of second-occurrence focus

This system is much more complicated than the simple cases with the directional operators that we have seen earlier. Therefore we need some more interpretation rules for each of the localized operators. Rooth (2009) gives the following rules:

(149) Phonological interpretations of localized l , r

(i) The phonological interpretation of a sequence l_α which begins with an l is that the left child of the labeled node must be metrically stronger than the right child.

(ii) The phonological interpretation of a sequence r_α which begins with r is that the right child must be stronger than the left one.

(iii) So in a sequence with more than one operator, only the first one counts phonologically.

At the step of the VP node, the left child is stronger. Then this comparative strength in phonological prominence is carried down to the respective focused element.

Now let's consider the example with a SOF wh-pronoun in Mandarin. Figure 2.9 is a sample derivation of the Mandarin wh-question.

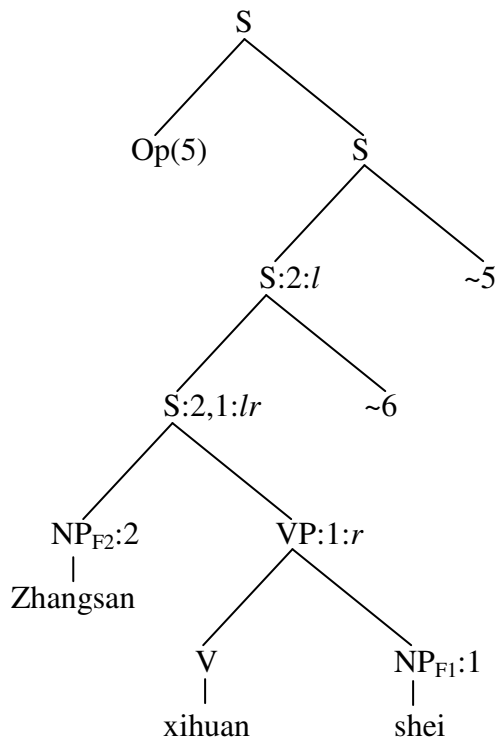


Figure 2.9: Focus projection in second-occurrence focus wh-questions

The idea is that both focus features project above the S level. But the main focus “Zhangsan” takes wide scope. The wh-pronoun takes narrow scope. The rest of the projection process is the same as in Figure 2.8 with the localized directional operators *l* and *r*. We see in Figure 2.9 that the scope of the wh-pronoun is still the S level. According to the Relativized Stress-F constraint, the wh-pronoun is still phonologically prominent in its scope, because we need to ignore the primary focus “Zhangsan”. Therefore the scope-marking strategy by the focus intonation in Mandarin can be generalized to such SOF cases.

There is one more question before we move on to the next topic. What is the semantic interpretation of the primary focus? It seems to me to contribute a set of questions. In the example in Figure 2.9, the set of questions can be:

(150) Sets of questions

{Zhangsan xihuan shei; Lisi xihuan shei;
Wangwu xihuan shei;}

Then this set of questions can be used by Op at the topmost level of S, as shown in Figure 2.9. As to the exact meaning of Op I will not discuss it further here³⁷.

Now that I have dealt with the scope marking strategy in matrix questions, let's look at embedded questions. As I mentioned, Huang (1982a) regards embedded wh-questions in Mandarin as ambiguous between an embedded question reading and a matrix question reading, if the embedded verb is [\pm wh]. For example:

³⁷ Note that the localized operators in Rooth's (2009) theory have both a phonological interpretation and a semantic interpretation. I am only using the phonological interpretations of them here. For the primary focus occurrences of wh-pronouns, the Alternative Semantics (Shimoyama 2006) can be used to derive the question meaning. But for the SOF cases, I am not sure how the Alternative Semantics can be put to work in a straightforward way. The semantics of the localized operators *l* and *r* could possibly work for these examples. But I am not going to deal with the details in this chapter.

(151) Zhangsan zhidao shei xihuan Lisi.

Zhangsan zhidao who like Lisi

Zhangsan knows who likes Lisi

a. Zhangsan knows who likes Lisi.

b. Who is the person such that Zhangsan knows that he likes Lisi.

The sentence in (151) can be either a declarative or a question. However this view of such sentences does not take the phonological properties of the wh-pronoun into consideration. There is no neutral intonation that would correspond to this ambiguity. In actual speech, the wh-pronoun has to be phonologically the most prominent, either in the embedded clause or in the matrix clause. In this section, I will just discuss the phonological aspects of scope marking, while in the next section, i.e. section 2.7, I will give phonetic evidence for this claim. For now, let's consider the following examples:

(152) Zhangsan zhidao **shei** xihuan Lisi.

(153) Zhangsan zhidao **SHEI** xihuan Lisi?

In (152), the wh-pronoun is the most prominent in the embedded clause. Then the whole sentence can be interpreted only as a declarative. In (153), the wh-pronoun is the most prominent in the whole sentence, and the sentence can be interpreted only as a question³⁸. Therefore the two interpretations correspond to the different focus feature projections. We see again the scope marking of wh-questions by focus

³⁸ This matrix-scope reading of the wh-pronoun does not have the same use as the English "Who does Zhangsan know Lisi likes?". In many cases, such matrix-scope questions are not the most natural way of asking the question. If indeed a matrix question reading is needed, then the wh-pronoun needs to be syntactically scoped out. For example:

(i) Shei₁, Zhangsan zhidao ta₁ xihuan Lisi
Who Zhangsan know he like Lisi
Who does Zhangsan know that likes Lisi?

intonation. According to the Alternative Semantics theory of questions, the expansion of the alternative set stops when it meets a binder. Then what is such a binder in the case of (152)? I propose that the lexical semantic of “know” introduces either a universal quantifier or an existential quantifier.

Beck and Rullmann (1999) discuss two readings of the proposition-embedding “know”, i.e. the exhaustive and the non-exhaustive reading. Their semantics is:

$$(154) \text{Know}_{\text{exhaust}}(w)(x, Q) \text{ iff } \text{know}_{\text{prop}}(w)(x, \text{answer2}(w)(Q))$$

$$(155) \text{Know}_{\text{mentionsome}}(w)(x, Q) \text{ iff } \exists p[Q(w)(p) \ \& \ \text{know}_{\text{prop}}(w)(x, p) \ \& \ p(w)]$$

In (154), $\text{answer2}(w)(Q)$ is the exhaustive answer to Q in w . The formula essentially says that x knows the exhaustive answer to Q . In (155), the contribution of the verb “know” is to introduce a propositional existential quantifier. In order to use these two lexical entries in Alternative Semantics terms, we need to modify them as follows:

$$(156) x \text{ know } \forall Q \text{ iff } \forall p \in Q. [[p(w) \rightarrow x \text{ knows } p] \ \wedge \ [\neg p(w) \rightarrow x \text{ knows } \neg p]]$$

$$(157) x \text{ know } \exists Q \text{ iff } \exists p \in Q. [p(w) \ \wedge \ x \text{ knows } p]$$

In (156), the verb “know” introduces a propositional universal quantifier. The truth conditions are: for all the propositions in the alternative set Q , if p is true in w , then x knows p ; if p is false in w , then x knows not p . This corresponds to the exhaustive reading of “know”. In (157), “know” introduces a propositional existential quantifier. The truth conditions are: there exists a proposition in the set of alternatives Q such that p is true in w and x knows p . Now let’s take a look at how the embedded question reading is derived. In Figure 2.10, the projection of the focus feature stops at the ~

operator. The set of alternatives is then used by the existential or universal quantifiers to derive the meaning of the sentence.

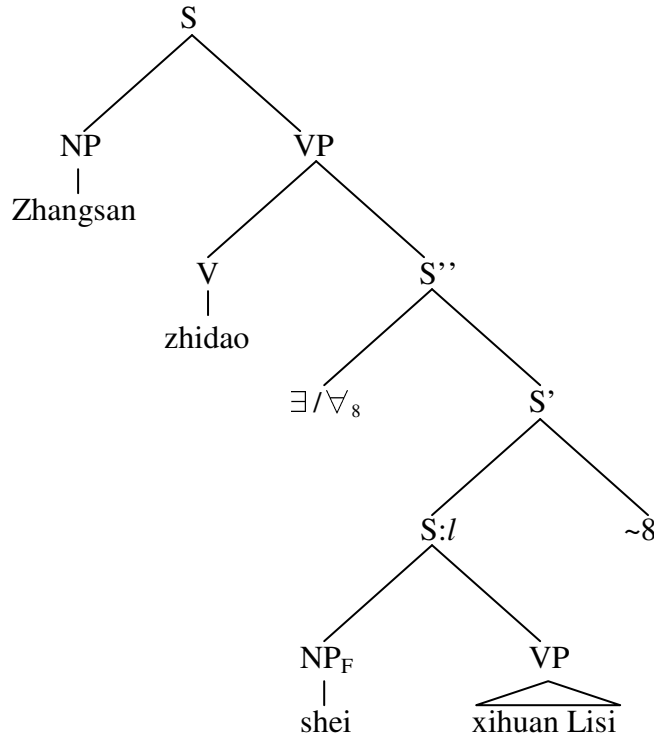


Figure 2.10: Embedded question derivation option 1

However, in most other cases, the focus semantics is not used in the compositional semantics of the sentence. Focus semantic constraints are rather of a pragmatic nature. They do not interact with the ordinary semantic value. Therefore the \sim operator does not feed into compositional semantics. Thus I want to suggest that in embedded questions, the existential or universal quantifiers are used directly to close the alternative set as shown in Figure 2.11. This is actually more in line with the propositional quantifiers in the Alternative Semantics theory of questions. Which of these two options is correct? Option 2 shown in Figure 2.11 seems to me to be both economical and conceptually compatible with what we assume in focus semantics.

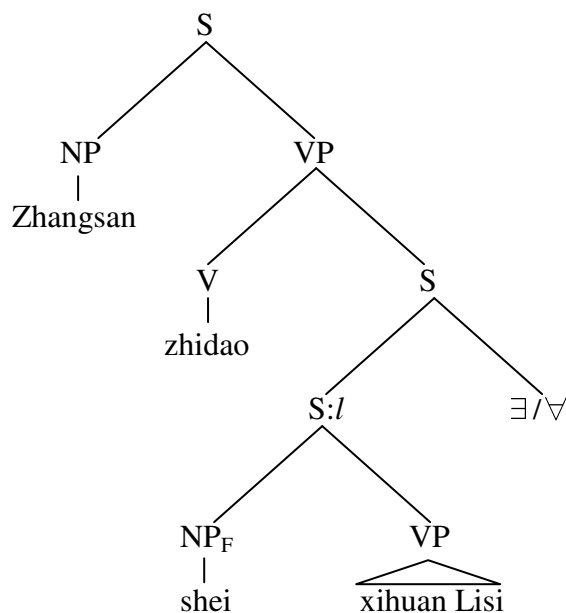


Figure 2.11: Embedded question derivation option 2

Finally as for the matrix question reading, it just proceeds as usual until it reaches the top level. I will not illustrate the whole process here, because it is essentially the same as in Figure 2.5.

In multiple wh-questions, the situation is more complicated. Intuitively if the wh-phrases have the same scope, either all matrix scope or embedded scope, then the wh-phrases should have equal phonological prominence. For example:

(158) Zhangsan zhidao **shei** na-le **shenme**.

Zhangsan know who take-PRF what

Zhangsan knows who took what.

(159) Zhangsan zhidao **SHEI** na-le **SHENME?**

Zhangsan know who take-PRF what

For which <x, y>: x a person, y a thing, Zhangsan knows that x took y?

In (158), none of the two wh-pronouns are the most prominent in the whole sentence, and they have equal phonological prominence in the embedded clause. This is a case of embedded scope for multiple wh-phrases. In (159) both wh-pronouns are equally the most prominent in the whole sentence, and this is a case of matrix scope for multiple wh-phrases. These two cases are similar to the wh-questions containing a single wh-phrase in that there is only one phonological pattern for the wh-phrases. What about a mixed scope reading? Huang (1982a) argues that two embedded wh-phrases can have difference scopes in Mandarin. He gives the following examples:

(160) [Ni xiang-zhidao [shei mai-le shenme]]?

You wonder who bought what

(161) Wo xiang-zhidao Lisi mai-le shenme

I wonder Lisi bought what

I wonder what Lisi bought

(162) Wo xiang-zhidao shei mai-le shu

I wonder who bought books

I wonder who bought books

According to Huang (1982a), the sentence in (160) can be answered either by (161) or by (162). In the former reading, the embedded *shei* takes matrix scope, while in the latter reading, the embedded *shenme* takes matrix scope. Huang (1982a) also notes that “if the question is uttered with emphatic stress on *shei* “who” then (b) [i.e. (161) here] comes as a more natural answer. If *shenme* “what” is stressed, then (c) [i.e. (162)] comes more readily.” Thus it seems that Huang (1982a) claims that phonological prominence can help distinguish the two different readings. Although this is in line with my claim that wh-scope is marked by phonological prominence in Mandarin, the

mixed readings in the above examples could be a problem for the Alternative Semantics. One of the advantages of adopting the Alternative Semantics for Japanese indeterminate phrase is that mixed readings are ruled out automatically. For example:

$$(163)^*[[\dots wh \dots wh \dots] \dots ka/mo] \dots ka/mo]$$

The set of alternatives in (163) will be closed by the first *ka* or *mo*, and it is not possible for either of the two *wh*-indeterminates to be associated with the second operator *ka* or *mo*. This follows naturally from the compositional semantics of the Alternative Semantics. But in Mandarin, there is no such overt operator. If we assume that there are covert operators in Mandarin, then the mixed reading should be ruled out as well. It is theoretically not possible to derive the mixed reading. In this respect, the Quantificational theory and the Unselective Binding theory have their advantages to allow such mixed readings. For example:

$$(164)[shei [ni xiang-zhidao [shei mai-le shenme]]]$$

$$(165)[Q_1 [ni xiang-zhidao [Q_2 [shei_1 mai-le shenme_2]]]]$$

In the Quantificational theory, the wide-scope *wh*-phrase can move to the matrix *C*, as long as it is allowed, as shown in (164). In the Unselective Binding theory, the two *wh*-phrases can be associated with two different binders as shown in (165), although in this case the binders are more selective than unselective. I have shown that the Alternative Semantics theory has many advantages when applied to Mandarin questions. If the mixed reading in embedded multiple *wh*-questions is indeed possible,

then it might be evidence against the applicability of the Alternative Semantics theory in Mandarin.

On an intuitive level, the mixed readings mentioned by Huang (1982a) are more naturally used as echo questions. These questions are used to ask for clarification when one did not hear what was said the first time. If these mixed readings are echo questions, then they do not act as counter-evidence to the applicability of the Alternative Semantics theory in Mandarin, since echo questions have their own peculiar phonological and pragmatic properties that are different from the normal uses of questions. Then what about a genuine non-echo use of the mixed reading questions? In section 2.7, I will provide experimental evidence that such mixed readings have the least phonological consistency and the lowest ratio of correct perception. These might be evidence against the use of mixed scope in embedded wh-questions in Mandarin. Thus it is evidence in favor of the Alternative Semantics theory as applied to Mandarin.

Let's put the mixed readings aside temporarily here, and summarize the points made in this section. So far I have shown that in embedded questions, the phonological prominence reveals the scope of the wh-pronoun. Taking both matrix questions and embedded questions into consideration, the conclusion is that phonological prominence is the sole scope marker of wh-pronouns in Mandarin. In contrast, Japanese uses an overt scope marker in wh-questions, and the focus intonation is mostly a phonological realization of the focus feature on the wh-pronoun, and in some cases, phonological prominence does not match wh-pronoun scope, and it is the question particles that determine the scope of the question. But as to the focus projection in such mismatch cases, I am not sure about the details so far, because the focus projection process illustrated in this section always predicts a parallel between phonological prominence and wh-pronoun scope.

By now I have shown how the two problems with Mandarin wh-questions can be accounted for in the Alternative Semantics theory of questions. The two problems are: (i) whether there is wh-movement; (ii) if no movement, how can scope be marked without having to introduce an unselective binder. The alternative semantics gives a straightforward semantics and syntax for the in-situ interpretation of wh-pronouns. The scope is marked by either question particles, as in Japanese, or by focus intonation, as in Mandarin. In the next section, I will give experimental phonetic evidence for the scope marking strategy in Mandarin as I have described so far.

2.7 Phonetic Evidence for the Scope Marking Strategy

In this section, I will give experimental phonetic evidence for my claim that wh-scope is marked by phonological prominence in Mandarin. I will first discuss Hu's (2002) study of the phonological properties of unembedded wh-sentences in Mandarin. Then I will discuss a phonetic experiment I carried out to study the phonological properties of embedded wh-sentences.

Hu (2002) studies the following types of sentences.

(166) Shui lai-le ne?

Who come-PRF PAR

Who came?

(167) Shui lai-le?

Who come-PRF

Who came?

(168) Shui lai-le ma?

Who come-PRF Q

Did someone come?

(169) Shui lai-le?

Who come-PRF

Did someone come?

In (166), the wh-question is marked by the particle *-ne*, and it can only be a wh-question. In (167), with the correct intonation and context, the sentence can be the same as the wh-question with the particle *-ne*. In (168), the particle *-ma* indicates that it is a polarity question, and in this case the wh-pronoun can be interpreted only as an existential. In (169), with the correct intonation and context, the sentence can be a polarity question. Hu's (2002) main point of interest is the use of intonation to disambiguate sentences such as (167) and (169), since they are string identical. Hu (2002) recorded four native speakers. The following is a figure given by Hu (2002) of the pitch contour of the four sentences recorded by one speaker.

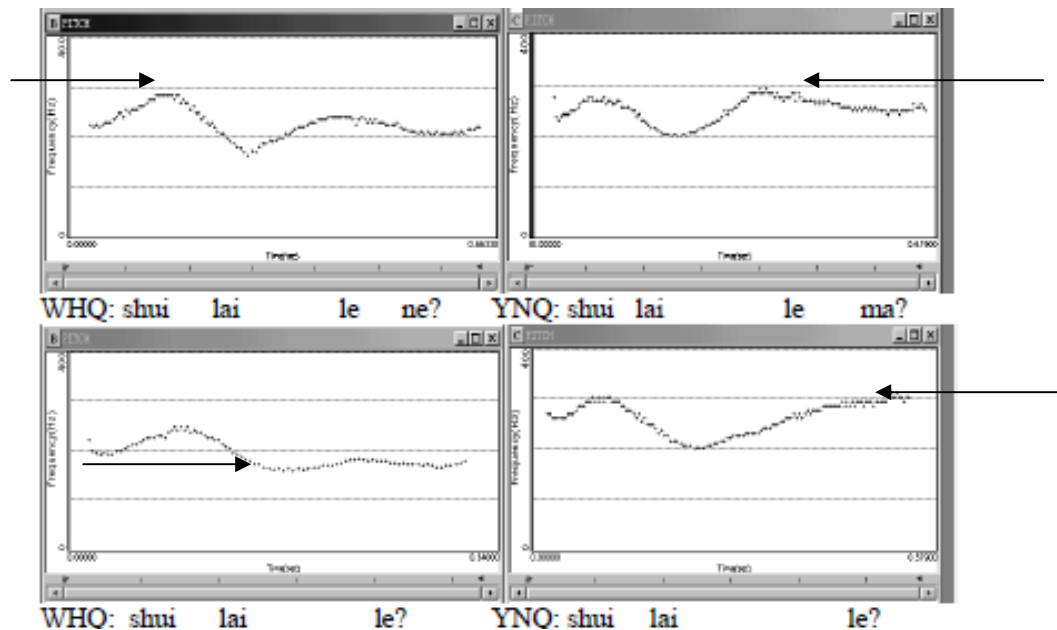


Figure 2.12: F0 contours of four types of sentences (Hu 2002)

As we can see from this figure, in wh-questions shown in the two pictures on the left, the wh-pronoun *shui* has the most prominent pitch contour, and in the bottom left picture, the pitch contour after the wh-pronoun is suppressed, shown as rather flat compared to the other three pictures. This is in line with what Ishihara (2002, 2006) observes in Japanese. On the other hand, the two pictures on the right show that the verb has the most prominent pitch contour in the polarity questions where the wh-pronoun is used as an existential. Based upon such experimental phonetic data, Hu (2002) draws the following conclusions.

(170) Hu's (2002) conclusions on the intonation of wh-sentences

(i) wh-words in wh-questions are the focus of the sentence, whereas in yes/no-questions, VPs are the focus.

(ii) The focused constituent is pitch accented so that its lexical tonal melody is retained and sometimes reinforced, while the lexical tonal melody of the corresponding unfocused constituent is compressed and sometimes reduced to a level tone.

The factors relevant to the pitch accent or prominence include the shape of the pitch contour, the highest pitch, span of the contour, and duration. Hu (2002) finds that the focused element has a fuller contour shape which contains the highest pitch point within the whole sentence. Usually a fuller contour shape corresponds to bigger span between the lowest pitch and the highest pitch, and a greater duration in some cases. Hu (2002) does not find that intensity is a significant factor.

Thus it is evident from Hu's (2002) study that the wh-pronoun in a wh-question is focused and the most prominent in the whole sentence. This is indeed what I have argued for earlier in this chapter.

But there are a few problems with Hu's (2002) study. First, it is only about matrix wh-sentences. We need to consider more complicated cases to see if the observations also hold in a broader context, e.g. embedded wh-questions. Second, the study did not take possible structural prominence into consideration. It might be the case that a certain constituent might be more prominent in a neutral setting. This can be seen from the bottom right picture in Figure 2.12. The existential wh-pronoun in the subject position is still quite prominent, almost having the same highest pitch point as the VP. Therefore I carried out an experiment to extend Hu's (2002) study and also to test my own hypothesis of the scope-marking strategy in Mandarin wh-questions.

First let me describe the design of my experiment.

The experiment consists of two major parts: production and perception. In the production experiment, speakers are asked to participate in natural conversations which contain various wh-sentences to be recorded. In the perception part, the recorded wh-sentences are randomized and played to another set of speakers. They are asked to judge whether they hear a question or a statement.

I recorded four native speakers of Mandarin. In the perception experiment, I also asked four other native speakers to participate. These eight speakers come from different provinces in Mainland China and Taiwan, with Mandarin as their native language. There are two male native speakers and six female native speakers. Their ages range from earlier twenties to fifties. The choice of native speakers represents a broad range of Mandarin speakers.

In the production experiment, all sentences are constructed with words that have the second tone, i.e. MH. The same tonal shape makes it possible to observe and compare the tonal contours and pitch ranges within a sentence. In each recording session, a questionnaire is given to a subject. The first part of the questionnaire

contains four sentences. For example, Speaker 1 was asked to read the following four sentences in a natural way.

(171) Mei yeyu-le Lei.

Mei ridicule-PRF Lei

Mei ridiculed Lei.

(172) Mei yeyu-le shei?

Mei ridicule-PRF who

Who did Mei ridicule?

(173) Shei yeyu-le Lei?

Who ridicule-PRF Lei

Who ridiculed Lei?

(174) Haoxiang Mei yeyu-le shei.

Seem Mei ridicule-PRF who

It seems that Mei ridiculed someone.

The first sentence is a statement without a wh-pronoun. The point is to see whether a certain non-focused constituent is naturally more prominent. The second and the third sentences are wh-questions with a wh-pronoun in the object and the subject positions respectively. The point is to compare the focused wh-pronouns with other elements in the sentence, and also with the non-focused DPs in the declarative sentence in (171). Note that the vowels in the name words are the same as in the wh-pronoun *shei*. This makes the cross-comparison easier. The fourth sentence is a wh-existential statement. The word *haoxiang* (“seem”) is a wh-existential licenser. I’ll talk more of these licensers in Chapter 3. In the perception experiment, the licenser word *haoxiang* is edited out so that the recordings of sentences like (172) and (174) contain the same

words, and the only difference between them is the intonation. This part of the production experiment is essentially the same as Hu's (2002).

The second part of the questionnaire contains four written conversations. I read the Part A in the conversations, and the subject read the Part B. The last sentence of each conversation was recorded. For example, Speaker 1 was asked to read the Part B in each of the following conversations³⁹.

(175) Conversation 1

A: I want to know which student did not come to class. Who should I ask?

B: You should go ask Huang Rong.

Huang Rong mingbai shei mei lai.

Huang Rong clear who not come

Huang Rong is clear who didn't come.

(176) Conversation 2

A: Huang Rong told me that some student did not come to class. So obviously she knows about this.

B: Oh, really, but which student?

Huang Rong mingbai shei mei lai?

Huang Rong clear who not come

Who does Huang Rong know didn't come?

³⁹ In the conversations, I used all Mandarin sentences. But here I translated those sentences that were not recorded into English, and kept the original Mandarin sentence only for the relevant sentence for the experiment. Also I used the verb *mingbai* "to be clear", instead of the usual *zhidao* "know", because the tones of *zhidao* are not the second tone, while *mingbai* contains two second tones, although in most cases the second character *bai* is read with a neutral tone.

(177) Conversation 3

A: Some students took some things from the office. I want to know the details. Who should I ask?

B: You can go ask Huang Rong.

Huang Rong mingbai shei na-le shenme.

Huang Rong clear who take-PRF what

Huang Rong is clear who took what.

(178) Conversation 4

A: Huang Rong saw that some students took some things from the office. So obviously she knows what these students took.

B: But there are so many students. I don't think all of them took some things from the office. So...

Huang Rong mingbai shei na-le shenme?

Huang Rong mingbai who take-PRF what

For which person x, Huang Rong knows that x took what?

As is clear from the examples, the first two conversations are about embedded wh-questions with a single wh-phrase. The first conversation has an embedded wh-question with an embedded scope, while the second conversation has exactly the same embedded wh-question, but with a matrix scope. The remaining two conversations are about mixed readings in embedded multiple wh-questions. In Conversation 3, both

wh-phrases have embedded scope. In Conversation 4, one of the wh-phrases takes matrix scope.

For the other three speakers, the names in these example sentences are changed, and the main verbs in the four sentences in (171)-(174) are also changed. Everything else is kept the same. Thus I recorded 32 sentences in total.

After the recording, I conducted a perception experiment with four other native speakers. From the recorded sentences by Speaker 1, I chose sentences (172) and (174) minus the word *haoxiang*, and the four sentences in the four conversations. I chose the same types of sentences from the recordings by the other three speakers. Thus I got 24 different sentences altogether. These sentences form twelve pairs. In each pair there are two string-identical sentences with different intonations to indicate the scope of the wh-pronoun and hence the type of the sentence, being either a statement or a question. I randomized these 24 sentences and then played these sentences without any context to four different native speakers and asked them to indicate whether they heard a statement or a question. In cases where they were absolutely not sure, I asked them to choose “uncertain”. Therefore I got 96 sentences altogether for the perception experiment.

The design of the experiment is to see whether phonological prominence is used to mark scopes and to see whether such phonological prominence can be used by listener to retrieve the relevant scope information.

Now let me present the results and analyses of the experiments. First I want to discuss the unembedded sentences. In order to determine the relative prominence, I took the following measurements, based on the measurements Hu (2002) took: (1) the lowest pitch point in the contours of the subject DP/wh-pronoun, the verb, and the object DP/wh-pronoun, (2) the highest pitch point of the same constituent, (3) the span of the pitch contour of these same constituent, (4) the difference between the highest

pitch point of the subject DP/wh-pronoun and that of the object DP/wh-pronoun, and (5) the duration in time that corresponds to each constituent. Intensity was not measured. In the tables of measurements that follow, I will only report measurements that are relevant in determining the phonological prominence, and omit other insignificant measurements.

Table 2.4 shows the measurements in the first declarative sentence. As is shown, the highest pitch is always on the subject DP. The numbers in bold italics in the first column indicate the highest F0 within the whole sentence. The pitch of the verb is generally⁴⁰ lower than that of the subject DP but higher than the object DP. This table shows that in a neutral statement, the subject DP receives the phonological prominence by default. The pitch of the rest of the sentence has a general lowering tendency, with the object DP having the lowest pitch.

Table 2.4: Phonetic measurements of “DP V DP” type⁴¹

Pr01	H-subj	Span	H-verb	Span	H-obj	Span	H-subj–H-obj
S1	261	62	244	37	205	30	56
S2	307	90	268	52	274	90	33
S3	261	63	250	66	221	55	40
S4	196	53	194	119	79	12	117
Mean	256.3	67	239	68.5	194.8	46.8	61.5
StDevP	39.5	13.8	27.4	30.9	71.5	29.3	33.1

⁴⁰ With the exception of the recording by Speaker 2, where the H-verb is slightly lower than the H-obj.

⁴¹ Pr01 = the first sentence recorded in the production experiment. H-subj = highest pitch point of subject DP in Hz; H-verb = highest pitch point of verb in Hz; H-obj = highest pitch point of object DP in Hz; H-subj – H-obj = difference between the two F0 in Hz; Span = difference between the lowest pitch and the highest pitch in Hz. It refers to the preceding pitch number in each case. S1-S4 refer to speakers. Mean = the average of the measurements for the four speakers. StDevP = Standard Deviation of Population.

Table 2.5 shows the second sentence which has a wh-pronoun in the object DP position. According to what I have suggested in Section 2.6, wh-pronouns have a focus feature. The focus feature is expressed as phonological prominence. Therefore we would expect that the highest pitch in the sentence falls on the object DP in this case.

Table 2.5: Phonetic measurements of “DP V who” type⁴²

Pr02	H-subj	Span	H-verb	Span	H-obj	Span	H-subj – H-obj
S1	272	88	259	66	289	101	-17
S2	331	123	278	59	244	74	87
S3	256	74	226	54	225	66	31
S4	233	64	195	61	185	54	48
Mean	273	87.3	239.5	60	235.8	73.8	37.3
StDevP	36.2	22.3	31.7	4.3	37.4	17.3	37.3

It is true in the recording by S1 that the highest pitch is on the object wh-pronoun. But for the other three speakers, the highest pitch is still on the subject DP. This might be due to the default prominence of the subject DP, as shown in Table 2.4. Therefore if the object wh-pronoun in Table 2.5 indeed has a focus feature, then we would expect that such wh-pronouns are more prominent than those non-wh object DPs in Table 2.4, and it will result in a smaller difference between the highest pitch point on the subject DP and the object DP/wh-pronoun. Thus I calculated this difference in pitch and the numbers are shown in the last column in both tables. If we look at the individual numbers, then the results are mixed. Two of the numbers (S2, S3) show that the difference is actually bigger in the wh-question in Table 2.5. But if we

⁴² The category labels are the same as in Table 2.4.

look at the mean value of the difference, it clearly shows that the difference between the pitches of the subject and the object is much smaller in the wh-question, i.e. 37.3 vs. 61.5. This can be accounted for if the object wh-pronoun has a focus feature and its phonological prominence is boosted. Relatively speaking, the boost in pitch also leads to a boost in the span of the pitch contour in the wh-pronoun, as is shown from the column named “Span” right after the “H-obj” column. As for the pitch on the main verb, it is generally slightly higher than the object wh-pronoun.

This reminds us of the experiment reported by Hu (2002) in Figure 2.12. In the bottom right picture, the existential wh-pronoun is supposed to be much less prominent than the verb. But from the picture, we can clearly see that the highest pitch point of the existential wh-pronoun is almost the same as the highest pitch point in the verb. This is expected if we take the default prominence of the subject DP into consideration. The pitch of the existential wh-pronoun in the subject DP is actually reduced due to the lack of focus. But the effect of the structural prominence still makes it quite prominent in relation to the verb.

Now the question is how we can determine the prominence in the type of wh-questions shown in Table 2.5, if the highest pitch on the wh-pronoun in the object position is not necessarily the highest within the whole sentence. One way of assigning phonological prominence to the wh-pronoun in the object position is to find how much the structural prominence on the subject DP is and take that number out of the overall pitch measurements. But this is probably very difficult to measure accurately. Thus the second way of assigning phonological prominence is by taking into multiple factors at the same time. For example, the highest pitch point, the boost of default pitch level, and perception of prominence can all be considered. As we will see from the perception part of my experiment, the accuracy ratio on such sentences is

100%. Apparently native speakers have no difficulty in determining the phonological prominence of the wh-pronoun in the object position.

Now let's consider the third type of sentences with a subject wh-pronoun. Since the subject position is structurally prominent, we expect the prominence of such wh-pronouns to be even greater. Indeed this is the case as shown in Table 2.6.

Table 2.6: Phonetic measurements of “who V DP” type⁴³

Pr03	H-subj	Span	H-verb	Span	H-obj	Span	H-subj – H-obj
S1	300	66	255	43	253	64	47
S2	427	222	252	35	248	65	179
S3	239	86	221	57	227	73	12
S4	203	55	174	54	177	55	26
Mean	292.3	107.3	225.5	47.3	226.3	64.3	66
StDevP	85.2	67.2	32.6	8.8	30.1	6.4	66.4

In Table 2.6, the highest pitch falls clearly on the subject wh-pronoun. To determine the boost of the default prominence level, we can look at the last column where the difference between the pitch levels of the subject and object is shown. The difference in Table 2.6 is the greatest at 66, followed by the number in Table 2.4 at 61.5, and then the difference is the smallest in Table 2.5 at 37.3. Thus the subject wh-pronoun is focused and the level of prominence is boosted due to the focus feature.

Table 2.7 shows the fourth type of sentences where the wh-pronoun in the object position is interpreted as existential. One striking feature of the measurements in Table 2.7 is the single-digit numbers in the last column. Although the measurement for the recording of S2 is not a single digit number, it is still pretty close to that. Also

⁴³ The category labels are the same as in Table 2.4.

the standard deviation is relatively smaller than in most other cases, although it is possibly due to the small numbers in each cell. Clearly these single digit numbers reflect a strong compression of the pitch contours. If we look at the other three tables, i.e. Table 2.4, Table 2.5 and Table 2.6, the span of any constituent would not be compressed into a single digit. Another feature of Table 2.7 is that the verb shows the highest pitch in terms of the mean value. Individually the verb has either the highest or almost equally highest pitch compared to the subject DP. This shows that the pitch level of the verb is boosted and becomes the most prominent.

Table 2.7: Phonetic measurements of “DP V existential-wh” type⁴⁴

Pr04	H-subj	Span	H-verb	Span	H-obj	Span
S1	266	52	257	45	165	4
S2	295	25	305	136	156	11
S3	268	47	312	131	142	6
S4	188	33	169	36	124	9
Mean	254.3	39.3	260.8	87	146.8	7.5
StDevP	35.7	9.6	51.0	41.7	13.8	2.4

The following two figures show the pitch contour of the second and fourth sentences recorded by Speaker 1. In Figure 2.13, the wh-pronoun *shei* in the object position has the highest pitch and a fuller tonal contour. Thus it is the most prominent constituent, and this sentence is a wh-question. In contrast the wh-pronoun in Figure 2.14 is quite compressed and the tonal contour is very flat. The overall pitch level of this wh-pronoun is very low, while the pitch levels of the verb and the subject DP are almost the same, both at a much higher level than the wh-pronoun.

⁴⁴ The category labels are the same as in Table 2.4.

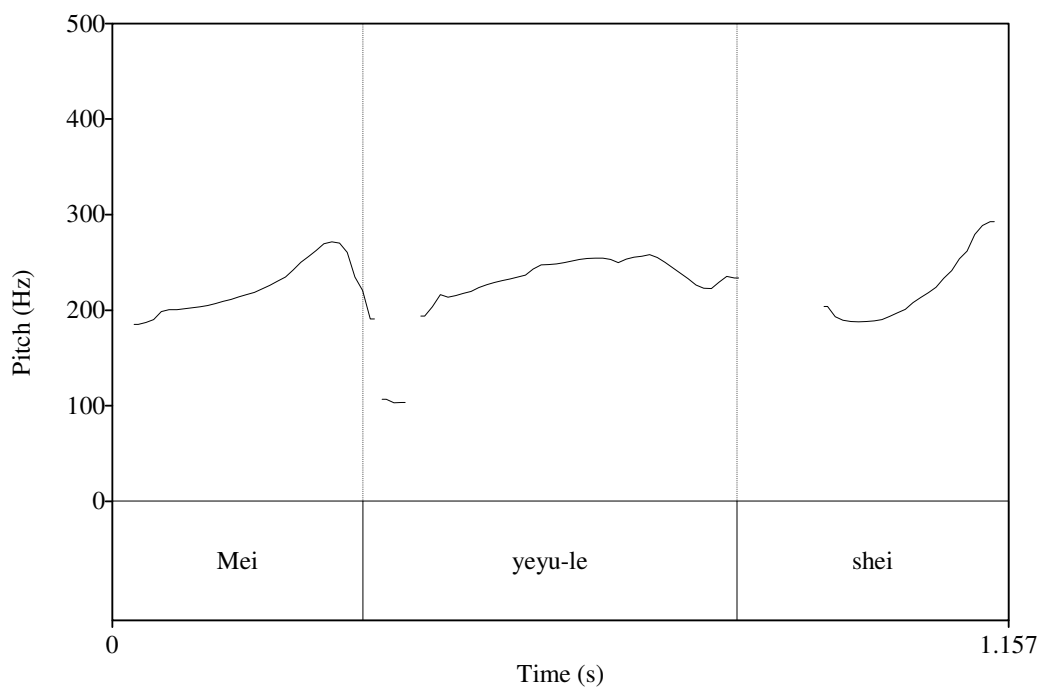


Figure 2.13: Matrix clause wh-question (Speaker 1)

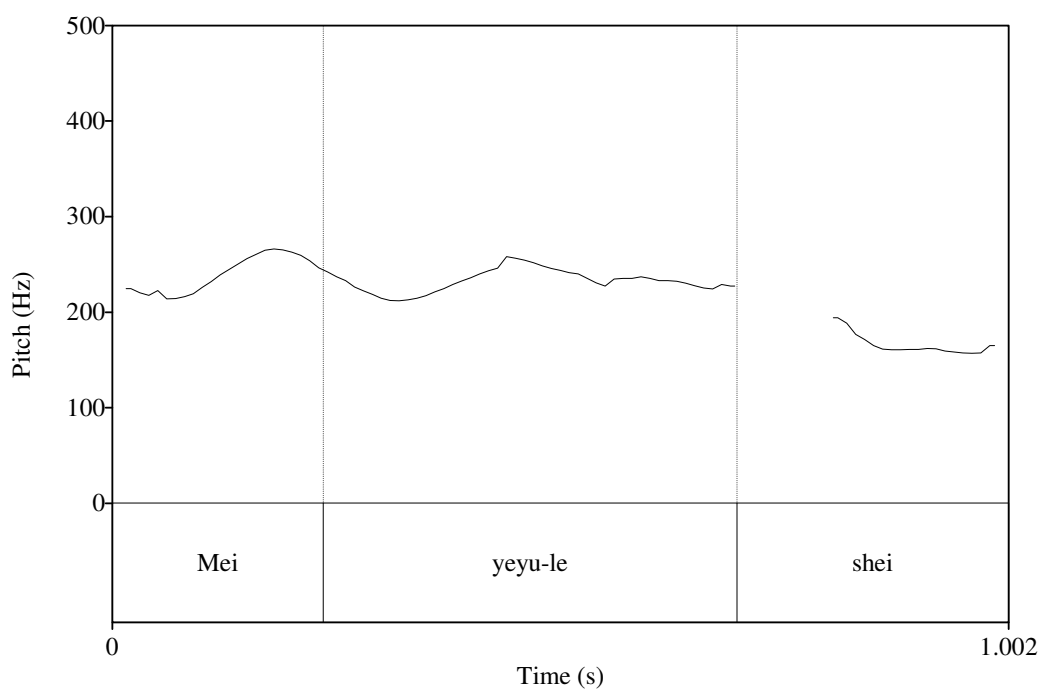


Figure 2.14: Matrix clause wh-existential (Speaker 1)

Now let me sum up the data and analysis so far. We have looked at matrix wh-sentences. The conclusion so far is (1) the subject DP is structurally prominent; (2) wh-pronouns in a wh-question is generally the most prominent, but a wh-pronoun in an object position may not have the highest pitch and the prominence should be determined by taking many other factors into considerations; (3) in sentences with wh-existentials, the wh-pronouns have compressed contours, and hence are the least prominent. The verb is generally speaking the most prominent; (4) prominence is mostly determined by pitch accent, and other factors like tonal contour and span, duration might also be taken into consideration when trying to determine the overall phonological prominence.

Next let's look at the embedded wh-questions. Table 2.8 shows the measurements of the fifth recorded sentence where a wh-pronoun takes narrow scope.

Table 2.8: Phonetic measurements of “DP V [who V]” type⁴⁵

Pr05	H-msubj	Span	H-mverb	Span	H-esubj	Span	H-everb	Span
S1	301	83	248	25	225	20	199	37
S2	293	66	242	26	218	20	199	46
S3	346	157	252	66	186	8	186	26
S4	243	68	200	51	153	6	157	42
Mean	295.8	93.5	235.5	42	195.5	13.5	185.3	37
StDevP	36.5	37.2	20.8	17.3	28.6	6.5	17.2	7.5

My hypothesis is that the scope of an embedded wh-pronoun is determined by its phonological prominence. If it is not the most prominent, then it takes embedded

⁴⁵ The “m” and “e” in the labels refer to “matrix clause” and “embedded clause” respectively, and basically the meaning of the labels is the same as in Table 2.4.

scope. If it is the most prominent, then it has matrix scope. Table 2.8 shows that the matrix subject is the most prominent in the whole sentence, while the embedded wh-pronoun is more or less the most prominent in the embedded clause, and it always has a rather compressed contour. This is in line with my hypothesis and the experimental data in the matrix wh-sentences shown above.

Table 2.9 shows the measurements of the sixth recorded sentence where a wh-pronoun takes wide scope.

Table 2.9: Phonetic measurements of “[DP V who V]?” type⁴⁶

Pr06	H-msubj	Span	H-mverb	Span	H-esubj	Span	H-everb	Span
S1	299	81	236	27	<u>243</u>	48	211	59
S2	315	73	294	57	412	203	253	72
S3	250	62	216	40	261	71	230	59
S4	270	98	260	71	220	57	274	101
Mean	283.5	78.5	251.5	48.8	284	94.8	242	72.8
StDevP	25.2	13.1	29.1	16.7	75.3	63.0	23.7	17.2

If we look at the mean values, the embedded wh-pronoun has the highest pitch which is just slightly above the matrix subject DP. Considering the structural prominence on the matrix subject DP, we can say that the embedded wh-pronoun has a greatly boosted pitch level. This boost can also be shown in the pitch contours indicated by the much greater span compared to Table 2.8, i.e. 94.8 vs. 13.5. But when we look at the individual measurements, it is more complicated. Both S2 and S3 assign the prominence to the embedded wh-pronoun. S1 assigns the prominence to the matrix

⁴⁶ Category labels are the same as in Table 2.8.

subject. If we look at the numbers from Table 2.8 and Table 2.9 for S1, they are essentially the same, i.e. 301 vs. 299 for the matrix subject DP, and 225 vs. 243 for the embedded wh-pronoun. Although there is a slight boost to the pitch level of the embedded wh-pronoun, it is nonetheless not very significant. These two sentences might very well have been read with the same intonation by S1. As we will see from the perception part of the experiment, 3 out of the 4 listeners reported S1's sentence in Table 2.9 as a statement. Thus it seems that this token of the recording by S1 does not use phonological prominence as a cue to scope and that leads to perceptual difficulty in judging the scope. Also worthy of noting is S4's recording, where the phonological prominence seems to fall on the embedded verb. A closer examination of this recording reveals that the speaker uses a polarity question intonation, which is indicated by a clear rising tone at the end of the sentence with a span of 101. But it seems that the level of pitch on the embedded wh-pronoun is also boosted at 220 compared to 153 in Table 2.8. Thus this sentence uses both a wh-question and a polarity question intonation to indicate the prominence of the embedded question. It probably only partially reflects the scope marking intonation of the embedded wh-question.

What is shown by these two tables is that there is a general tendency to assign a more prominent pitch accent to the embedded wh-pronoun if it takes wide scope, although in some cases the speakers did not use this intonation in a straightforward way. The following two figures show the pitch contours of the recordings by S2, which is the clearest use of this intonation for scope marking. In Figure 2.15, the embedded wh-pronoun is short and compressed at a lower pitch level, while the matrix subject DP is the most prominent. The general pitch level has a lowering tendency. In Figure 2.16, the embedded wh-pronoun is greatly boosted in terms of its pitch and it becomes the most prominent.

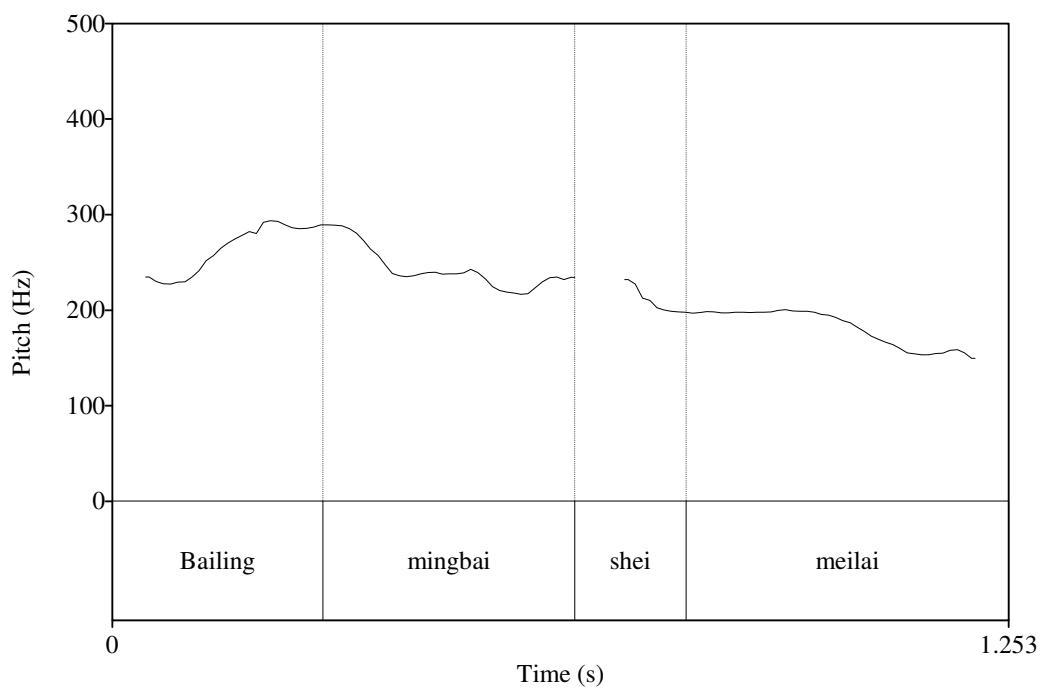


Figure 2.15: Embedded wh-scope (Speaker 2)

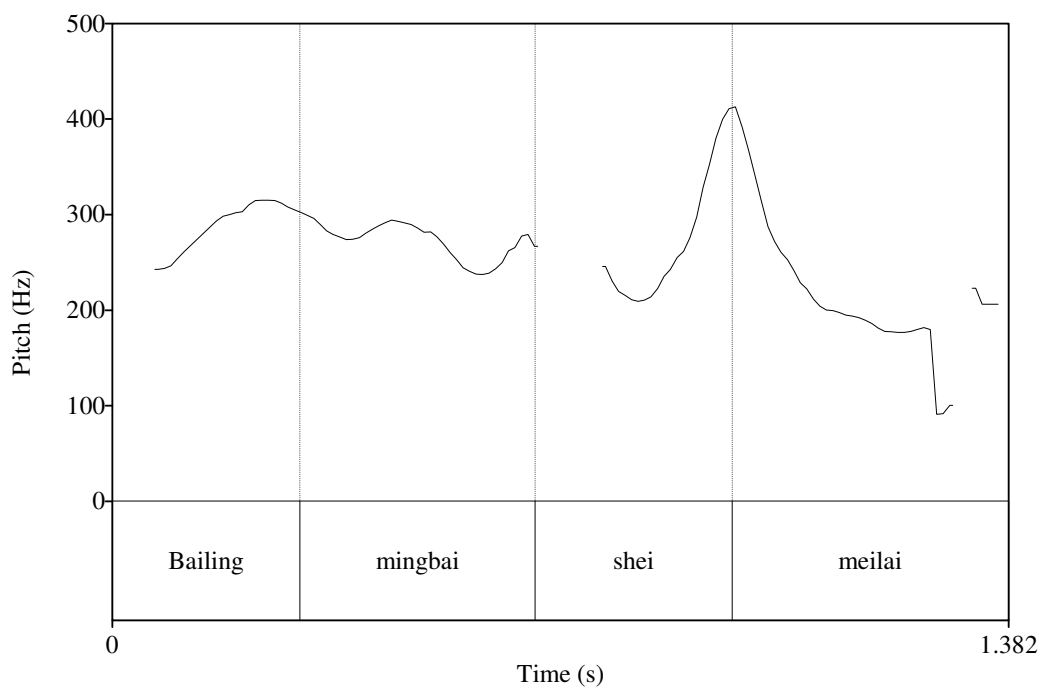


Figure 2.16: Matrix wh-scope of an embedded wh-pronoun (Speaker 2)

To sum up the discussion on embedded wh-questions so far, we can draw the following conclusions: (1) an embedded wh-pronoun takes narrow scope if it is not the most prominent; (2) an embedded wh-pronoun that takes wide scope generally has a boosted pitch level and contour, which indicates the prominence level, and in many cases it is the most prominent in the whole sentence.

Then what about mixed readings? If the Alternative Semantics theory is right about Mandarin wh-in-situ, then mixed readings should be ruled out. Although the data given by Huang (1982a) sound more like echo questions to me, instead of being genuine wide-scope wh-questions, it is nevertheless necessary to look at phonetic data to determine the use of intonation to mark the scope of the embedded wh-pronouns.

Table 2.10 is a case where both wh-pronouns take narrow scope. The data show that both wh-pronouns lack phonological prominence and the matrix subject DP is the most prominent. This is consistent with what we have seen so far.

Table 2.10: Phonetic measurements of “DP V [who V what]” type⁴⁷

Pr07	H-msubj	Span	H-mverb	H-esubj	Span	H-everb	H-eobj	Span
S1	315	107	247	210	8	195	149	11
S2	302	72	250	212	4	216	178	13
S3	290	117	217	203	28	192	180	44
S4	251	77	203	169	20	158	133	49
Mean	289.5	93.3	229.3	198.5	15	190.3	160	29.3
StDevP	23.9	19.2	19.9	17.4	9.5	20.8	19.8	17.4

Table 2.11 is a case where the speaker is asked to say a sentence with the embedded wh-pronoun in the embedded subject position taking wide scope. The data

⁴⁷ Category labels are the same as in Table 2.8.

show that only one speaker assigns the highest pitch to the embedded wh-pronoun in the embedded subject position. The other three speakers assign the highest pitch to the matrix subject, although the mean value of the pitch level of the embedded wh-pronoun is still the highest. Compared to Table 2.9, it seems that the speakers tend to assign the highest pitch to the matrix subject. Thus we need to look at perception results to see if the listeners can identify these as questions.

Table 2.11: Phonetic measurement of “[DP V who [V what]]?” type⁴⁸

Pr08	H-msubj	Span	H-mverb	H-esubj	Span	H-everb	H-eobj	Span
S1	306	82	240	273	73	227	156	15
S2	266	148	257	391	184	226	224	136
S3	258	68	220	247	72	220	181	18
S4	273	66	225	256	108	227	193	52
Mean	275.8	91	235.5	291.8	109.3	225	188.5	55.3
StDevP	18.3	33.5	14.4	58.1	45.5	2.9	24.5	48.8

Table 2.12 shows the perception results. First let’s look at Type 4. As I have mentioned earlier, S1 assigns almost identical intonation patterns to Type 3 and Type 4, and this leads to a perception result where 3 out of 4 listeners judged S1’s token of the Type 4 sentence as a statement. Therefore if we do not count this token of S1’s, we get a correctness ratio of 10 out 12, i.e. 83.33%. This is a pretty good ratio of accuracy. It shows that phonological prominence is indeed used by native speakers to indicate the scope of an embedded wh-pronoun. Next let’s look at Type 6, which is the mixed reading. The correctness ratio is only 56.25%, which is close to a 50-50 guess. Although there is a tendency for the speakers to assign the highest pitch to the matrix

⁴⁸ Category labels are the same as in Table 2.8.

subject DP, the listeners do not have clear clues to whether the sentence is a statement or a question. Among the 7 judgments that are wrong, two are “uncertain”. Thus it seems to me that most speakers do not judge these as ambiguous.

Table 2.12: Perception experiment results

Type	Total #	Correct	Wrong	Ratio of correct #
1. DP V who?	16	16	0	100%
2. DP V existential-wh	16	4	12	25%
3. DP V [who V]	16	16	0	100%
4. [DP V who V]?	16 [12]	11 [10]	5 [2]	68.75 [83.33%]
5. DP V [who V what]	16	15	1	93.75%
6. [DP V who [V what]]?	16	9	7	56.25%
All types	96	71	25	73.96%

One possible explanation to this low ratio is that there is no appropriate intonation for the mixed reading. This is either because it is not possible to have a genuine mixed reading, or because it is just too complicated to process. But in either case, the data do not show clear support for the existence of a mixed reading. In Huang’s (1982a) original proposal, the written sentence is regarded as ambiguous between two mixed readings and two same-scope readings (either two wide scopes or two narrow scopes). I have shown that the same-scope readings have clear intonation patterns that assign phonological prominence to the wide scope wh-pronouns. But there is no consistent phonetic data for the mixed readings. The written sentence might be ambiguous in the sense that you can read them with different intonation to mean different things. But clearly the mixed-scope readings do not have an appropriate intonation pattern. This suggests that such readings might not be natural. The original

examples given by Huang (1982a) are not ambiguous in the way as he described. I thus conclude here that there is no clear evidence as to the existence of mixed reading for multiple wh-questions in embedded situations. Thus it is in line with what the Alternative Semantics theory predicts, i.e. there should be no mixed readings in Mandarin.

Now let's look at Type 2, i.e. the existential readings. It has a strikingly low correctness ratio at 25%. Most listeners judge these sentences to be questions, although all speakers recorded the tokens with clear well-defined intonations. This actually is due to the lack of licensors. As I have described, I edited out the word *haoxiang* to make the Type 1 and Type 2 sentences identical. It turns out that without the licensors, tokens of Type 2 can be either a statement or a question. Thus it only shows that the licensor and context are important factors to determine the existential readings. I will talk about such readings in more detail in Chapter 3.

Now I want to summarize the phonetic evidence presented in this section. There is clear evidence that wh-pronouns are focus marked, as has been observed by others (Hu 2002 for Mandarin, Haida 2008 for other languages). Focused element receives the greatest phonological prominence which marks the scope of the wh-pronoun. There is no concrete evidence for the existence of mixed-scope readings. In the Appendix, pitch tracks for all recordings are included for further reference.

I have presented the major data and analyses of Mandarin wh-questions. In the next section, I want to explore the typological implications of my theoretical proposals.

2.8 Typological Implications

In a theory of questions, there are indeed two aspects to consider: semantic interpretation and scope marking. In terms of semantics, wh-pronouns can either introduce a set of alternatives directly, or provide a variable, or provide a quantifier. In

terms of scope marking, a language can resort to one of the following devices: syntactic movement⁴⁹, scope-marker particles, and focus intonation. Thus essentially my discussion so far has led to the following conclusion: the strategy of question formation used in one language is a result of choosing different parameters from the two sets, i.e. the semantic parameter set and the scope marking parameter set. Suppose the semantic parameter set contains two values: {alt, quant}⁵⁰, corresponding to the alternative semantics and the quantificational theories of questions. Also suppose that the scope marking set contains three values: {movt, par, foc}. Then if a language chooses one value from each set, we get the following typological possibilities:

Table 2.13: Conceptual space of wh-questions

	movt	par	foc
alt	Wh-indefinites Syntactic movement	Wh-indefinites Particles	Wh-indefinites Focus intonation
quant	Wh-quantifiers Syntactic movement	Wh-quantifiers Particles	Wh-quantifiers Focus intonation

This typological space is mostly very self-evident. But the quant-par and quant-foc types need a little more description. If a language does not use wh-based indefinites, then the wh-pronouns in such a language cannot be treated as contributing a set of alternatives, even if they are *in situ*. They should be treated similarly to English wh-pronouns. Thus if such a language uses scope-marking particles, it is quant-par; if it uses focus intonation, then it is quant-foc.

⁴⁹ Note that semantic scope does not necessarily have to be marked by syntactic movement. For example, quantifier scope in English is not marked by syntactic scope, while quantifier scope in Mandarin is. We can also imagine a language that uses a particle to mark quantifier scope.

⁵⁰ Theoretically speaking, there should be another value *var* corresponding to the Unselective Binding theory. However I am not quite sure if that will amount to the same thing as the alternative semantics. Therefore I will, for the time being, ignore this parameter.

Now in this table, the different scope marking strategies are mutually exclusive, i.e. there is no language which uses two different scope marking strategies equally at the same time. I will assume this mutual exclusivity in light of economical concerns. But if it turns out that a language can use any number of scope marking strategies in any combination, then the typological representations of these different types might look like [+alt, +movt, + par], in which the different dimensions become binary features.

The next important question is: what is the empirical evidence for this typology. Bruening (2004) gives a compelling typological survey of wh-questions. His conclusion is that there is no correlation between wh-in-situ and wh-variables, or between wh-in-situ and question particles, or even between wh-in-situ and wh-indefinites. According to his statistics of 577 languages, the distribution of languages with respect to wh-position and particles is:

Table 2.14: Bruening's typological statistics

	Wh-In-Situ	Wh-Movement
Q-Particle	258	123
No Q-Particle	143	53
Total	401	176
Percent Q-Particle	64%	70%

According to this table, there is no correlation between wh-position and particles. His classification only divides languages into four categories. In my classification there are six categories. By looking at the languages included in Bruening's (2004) survey, I find languages that represent each of the six categories in my typology, shown in Table 2.15.

Table 2.15: Representative languages in my typology

	movt	par	foc
alt	Passamaquoddy	Japanese	Mandarin
quant	English	Khalkha Mongolian	Gujarati

Passamaquoddy (Algonquian) is a typical alt-movt language. According to Bruening's (2004) report on his field work on this language, wh-pronouns can be used as indefinites in many different constructions. Actually the distribution of wh-pronouns in Passamaquoddy is the same as those in Mandarin. The only difference is that wh-movement is obligatory in Passamaquoddy. But Bruening (2004) does not report on the focus intonation of wh-questions in this language. Despite the lack of information on the intonation of wh-questions in Passamaquoddy, this language still qualifies as an alt-movt language. Even if focus intonation is used in its wh-questions, they are probably secondary, just as the focus intonation in Japanese.

Japanese is a typical alt-par language, and focus intonation is secondary in scope-marking, as is shown in the mismatch between the scope of the question particles and that of the focus intonation (Ishihara 2006).

Mandarin is a typical alt-foc language, as I have argued throughout this chapter. Bruening (2004) is also doubtful about the claim that Mandarin has a wh-question particle.

English is a typical quant-movt language, because English indefinites are not derived from wh-pronouns in most cases, and wh-movement is obligatory in English.

According to Bruening's (2004) survey, Khalkha Mongolian and Samoan have generic-noun-based indefinites, like *something*, and both languages have question particles. Thus I suspect that they are quant-par languages.

Also according to Bruening's (2004) report, Hindi and other South Asian languages have indefinites that are similar to but not derived from wh-words. If indeed so, they are quant languages. Gujarati is classified as a wh-in-situ language that does not have question particles. Therefore it is a possible candidate for quant-foc language.

As I mentioned, the choice among the scope-marking dimension might turn out to be not mutually exclusive. A language can use a combination of different scope-marking strategies, with one being the primary strategy and the others being secondary. On the other hand, the unavailability of certain scope-marking strategy in one language might be also related to other parameters in that language. For example, Japanese is a head-final/left-branching language. The use of question particles is a natural choice, since the boundaries of the argument constituent needs to be marked. On the other hand, in a language like Mandarin, which is right-branching, the use of question particles is less obvious, as can be shown by the interpretation of question particles with a possible embedded reading. For example:

(179) Zhangsan zhidao Lisi huilai-le ma?

Zhangsan know Lisi return-ASP Q

Does Zhangsan know that Lisi has returned?

The sentence in (179) has only a matrix question reading, but not an embedded reading, although conceptually the question particle can go either way. Thus the use of question particles in Mandarin does not necessarily help to mark scope of a question.

Therefore my discussion proposes a new typology of wh-questions, and it also supports Bruening's (2004) claim that there is no correlation between any of the following factors: wh-position, wh-interpretation possibilities and question particles.

Specifically for Mandarin, I have shown that Cheng's (1991) Clausal Typing Hypothesis (CTH) does not hold either theoretically or empirically. Theoretically, the Alternative Semantics theory of questions makes the *wh*-particle unnecessary. Empirically, the claim that *–ne* is a *wh*-particle is simply hard to maintain. Although the CTH does not seem to be correct, a more generalized theory of clausal typing might be correct. A clause needs to be typed somehow. For example, a *wh*-question needs to be typed somehow, but it does not have to be tied to the existence of *wh*-particles.

Another driving force behind my discussion is Tsai's (1999) Lexical Courtesy Hypothesis (LCH). It aims at a Minimalist theory of language. I have shown that the Mandarin type of *wh*-questions can be regarded as even more economical than the Unselective Binding theory, since not even an operator is needed in the interpretation of Mandarin *wh*-questions. However I want to point out that the LCH is only a criterion of syntactic Minimalism. It does not mean that there is an ultimate language that can achieve this Minimalist principle globally in terms of all of the components, i.e. syntax, semantics and phonology. For one thing it is hard to measure the Minimalist effect on the other two components and also it is conceptually correct in saying that the Minimalist effects achieved in one component might be offset by less Minimalist strategies in other components. For example, although the syntactic component in Mandarin *wh*-questions is the most economical in terms of the LCH, the scope marking strategy using focus intonation is probably less Minimalist, compared to a language where no special phonological information is needed.

2.9 Summaries

In this chapter, I have compared three different theories of questions, as applied to Mandarin. I have shown that the Alternative Semantics theory has many

advantages, both theoretically and empirically. The following conclusions have been achieved so far.

First, there is no need of resorting to wh-movement or unselective binding, if we apply the semantic interpretation process in the Alternative Semantics to wh-questions in Mandarin in a straightforward way. It leads to simplifications of the theory in many aspects.

Second, the Alternative Semantics makes wh-binders unnecessary. In fact there are no wh-particles in Mandarin, contrary to what Cheng (1991) claims. I also extend the Alternative Semantics to the other three types of questions in Mandarin, arguing that alternatives can be formed on different levels of constituent.

Third, scope marking of wh-pronouns is achieved by focus intonation in Mandarin. The simple constraint is formulated as Relativized Stress-F, which states that the wh-pronoun has to be the most prominent phonologically in their scope. I have also shown how this can be done in the focus projection system proposed by Rooth (2009). Semantically, the focus projection process is the same as the alternative expansion process, at least in Mandarin.

Fourth typologically speaking, the semantic interpretation parameters and the scope-marking parameters give rise to a typology of languages into six categories based on their wh-questions. This fact also supports the claim that there is no correlation between these different factors.

One of the crucial components in my discussion is the semantic interpretation mechanism in the Alternative Semantics theory. However, I am not suggesting that the Alternative Semantics theory is superior to all other theories. It has its own explanatory limitations. For example, Shimoyama (2006) does not deal with adjunct wh-questions. James Huang (*p.c.*) commented that the Alternative Semantics does not give a better account to the wh-argument-adjunct asymmetry, which has been one of

the central issues in wh-questions. Huang's (1982b) original version of the argument-adjunct asymmetry has been modified to include a more nuanced look at different types of adjunct wh-phrases. Tsai (2008) proposes the following for "how" questions in Mandarin. Causal wh and reason wh are analyzed as sentential operators in the left periphery, which scope over the entire IP; manner and instrumental wh's are both analyzed as vP-modifiers. Only instrumental wh, but not manner wh, may escape from strong island effects and weak intervention effects. On the other hand, reason "why" questions show island effect, while purpose "why" seems less constrained. If the Alternative Semantics can explain such phenomena successfully, it would indeed be the best theory. However this has yet to be done. In this dissertation, I will not try to tackle this question either.

Another potential complication for the Alternative Semantics is that multiple wh-questions are harder to deal with. For example:

(180) Shei xihuan shenme?

Who like what

Who likes what?

The answers to such questions are often pairs of things, i.e. the pair-list reading, either a single pair, a list of pairs or a functional answer. The Alternative Semantics seem to compose the two sets of alternatives contributed by the two wh-indefinites into an unordered set of alternatives. Then to answer such a question, different propositions have to be picked out from the set according to certain criteria in order to get the pair list reading. Although this does not seem to be a big deal, it does not seem to be a very economical or appealing approach. In the Alternative Semantics proposed by Kratzer (2006), there is no explicit analysis of multiple wh-questions. Therefore the details of

this new theory as applied to multiple wh-questions still need a lot of further research and analyses.

This concludes Chapter 2, which basically deals with the interrogative interpretations of wh-indefinites in Mandarin. In the next chapter, I will take a detailed look at the existential readings of such wh-indefinites.

CHAPTER 3

EXISTENTIAL CONSTRUALS OF WH-INDEFINITES

In this chapter, I use the Alternative Semantics theory to account for certain properties of the existential construal of wh-indefinites in Mandarin. I propose that the licensing environments for such existential wh-indefinites in Mandarin can be categorized into modal and non-modal ones. In the modal environments, existential closure is introduced under the modal. Then the modal checks off the focus feature carried by the wh-indefinites. This explains why the existential closure can not be introduced above the modal. This way of existential closure is an instance of the propositional existential quantifier in the Alternative Semantics theory. On the other hand, in non-modal environments, e.g. non-wh questions, the existential closure is introduced locally at the level of the wh-indefinite. This is comparable to the existential binder *-ka* in Japanese. Since the existential closure is local, it can check off the relevant features directly. The reason why such existential closure has to be local is that introducing the existential closure at higher levels leads to conflicts in the compositional semantics. I also argue against Jo-Wang Lin's (2004) observation of scopal variations of such wh-indefinites. I will show that there is both empirical and theoretical evidence against his observations. Existential wh-indefinite can not take wide scope over universal quantifiers and other interrogative wh-indefinites, due to the compositional semantics. All in all, I think the Alternative Semantics theory of wh-indefinites can indeed shed light on some issues in the existential reading of wh-indefinites in Mandarin.

The structure of this chapter is as follows. In section 3.1, I will lay out the licensing environments of such existential wh-indefinites, based upon work by (Lin 1996 and 1998b, Li 1992). I will classify the environments into two categories: modal

vs. non-modal. Data regarding the phonological properties of such existential readings will also be discussed. In Section 3.2, I deal with the semantics of non-local existential closure in modal environments. Section 3.3 discusses non-modal environments and shows that the existential closure is local to the wh-indefinites. Section 3.4 gives evidence that the existential readings cannot take scope over the universal quantifier and interrogative wh-phrases, contrary to what Jo-Wang Lin (2004) claims. In section 3.5 I summarize the whole chapter.

3.1 Licensing of Existential Wh-Indefinites

The most complete description of the distribution of existential wh-indefinites in Mandarin can be found in Lin (1996, 1998b). According to his studies, existential wh-indefinites are licensed in the following three groups of environments.

First, negation, if-clauses and non-wh questions form Group A, which are standard NPI licensing environments. For example:

- (1) Wo mei mai shenme. (Negation)

I not buy what

I did not buy anything.

- (2) Ruguo ni you shenme wenti, qing gaosu wo. (If-clause)

If you have what question please tell me

If you have any questions, please tell me.

- (3) Nimen you shenme wenti ma? (Question)

You.plural have what question Q

Do you any questions?

In (1), the existential reading is licensed by the negation which c-commands the wh-indefinite. In (2) the existential reading is licensed in the if-clause. Suppose for the time being here that it is the word “if” that licenses this reading and here again the licensor c-commands the wh-indefinite. In (3), it could be said that the question particle is the licensor. Here in order to maintain the c-commanding relation, a proper syntactic structure needs to be proposed, but this is not difficult to do. Recall that I have argued in Chapter 2 that the particle *–ma* is not a question particle, but rather a generic form of negation. I will show that the existential readings in polarity questions show support for my claim.

Polarity questions are the most natural licensing environment for existential wh-indefinites. As for the other types of questions in Mandarin, the VO-not questions and the A-not-A questions license such existential readings, while wh-questions and alternative questions do not. For example:

(4) Nimen you shenme wenti mei? (VO-not question)

You.plural have what question not

Do you have any questions?

(5) Nimen you-mei-you shenme wenti? (A-not-A question)

You.plural have-not-have what question

Do you have any questions?

(6) Shei you shenme wenti? (wh-question)

who have what question

(a) who has what questions?

(b) *who has any questions?

(c) *What questions does anyone have?

(7) (alternative question)

??Zhangsan you shenme wenti haishi Lisi you shenme wenti?

Zhangsan have what question or Lisi have what question

Intended reading: does Zhangsan have any question
or does Lisi have any questions?

In (4), the position of the negation “mei” is the same as the particle *–ma*. Such VO-not questions license existential wh-indefinites in the same way as polarity questions do. In (5), the A-not-A part, i.e. “you-mei-you”, is the licenser, and in some way, it can be said to be in a c-commanding position. In contrast to VO-not and A-not-A questions, wh-questions do not license existential readings as shown in (6)¹. It is fine on the multiple wh-reading as in (6)(a). If one of the wh-phrases is interpreted as an interrogative wh-phrase, then it could be a possible licenser of existential wh-indefinites if such readings did exist. However, as shown in (6)(b) and (6)(c), existential readings are not available either for the subject wh-phrase or for the object wh-phrase. Example (7) shows that alternative questions do not license existential readings of wh-indefinites either. Lin (1998b) does not mention such alternative questions. However I think they should be accounted for, since there is no reason to just leave only one type of questions out of the picture.

In terms of the structural requirement of licensing, as I have mentioned, the licenser should c-command the existential wh-indefinites. For example, subject wh-indefinites in an A-not-A question can not be interpreted as an existential phrase, as shown in (8).

¹ This example is similar to the example given by Li (1992: 128).

(8) *Shei you-mei-you wenti?

Who have-not-have question

Intended reading: Does anyone have questions?

The same structural requirement goes with other licensing environments as well.

Second, according to Lin (1998b) epistemic modality environments forms Group B. These include epistemic adverbs, inference *-le*, and nonfactive epistemic verbs². For example:

(9) Zhangsan keneng xihuan-shang-le shei. (epistemic adverb)

Zhangsan possibly like-up-PRF who

Zhangsan possibly has started liking someone.

(10) Ta kandao shenme le. (inference *-le*)

He see what PRF

He saw something. / He must have seen something.

(11) Zhangsan yiwei wo mai-le shenme. (non-factive epistemic verbs)

Zhangsan think I buy-PRF what

Zhangsan thought I bought something.

In (9) the adverb *keneng* expresses an epistemic possibility, i.e. in terms of what the speaker knows. Similar adverbs include *xiangbi* (“most probably”), *yiding* (“must”),

² Lin (1998) also lists the “necessity operator” as a licenser in bare conditionals such as:

Shei yaoshi qudao ta nü'er, shei jiu keyi jicheng ta-de shiye.
Who if marry his daughter who then may inherit his enterprise
“If x marries his daughter, then x may inherit his enterprise.”

There are two problems with this. First, it is not clear to me that the second wh-indefinite is indeed existential. Such sentences are normally treated as donkey sentences. So the second wh-indefinite might not be an existential at all. Second, if the first wh-indefinite can be interpreted as an existential, then such licensing environments are essentially the same as indicative conditionals.

dagai (“probably”), *yexu* (“perhaps”), *kongpa* (“I am afraid that”), *hoaxing...*(*de-yangzi*) (“it seems that”), *xiangshi* (“as if”), *xiang...zheyang(zi)* (“like”, “in the way that”), and etc. All these adverbs express an epistemic modal. It is a possibility or a necessity, or somewhere in between.

In (10), it is the use of the *-le* that licenses the existential reading. According to Li (1992), such uses of *-le* indicates that the speaker infers that something must have happened on the basis of his/her observation of the environment without witnessing the event of changing state. Take the sentence in (10) for example. It is felicitous in the following scenario. Zhangsan is looking out of the window at the garden. The speaker is sitting on the couch. He can see Zhangsan, but not the garden. Then Zhangsan waves his hand. Based upon such observations, the speaker can infer that Zhangsan saw something. As Lin (1998b) points out, it is easy to classify this use of circumstantial *-le* as a kind of uncertainty epistemic context. In fact, the epistemic adverbs often co-occur with this circumstantial *-le*. If an epistemic adverb is added to the sentence in (10), it will greatly improve the acceptability of the sentence.

In (11) the non-factive epistemic verb *yiwei* (“think”)³ licenses the existential reading. Verbs of this category includes *renwei* (“think”), *xiwang* (“hope”), *cai* (“guess”), *huaiyi* (“doubt”), and etc. Factive epistemic verbs like *zhidao* (“know”) and *houhui* (“regret”) do not license existential wh-indefinites.

Third, Group C includes environments that express some sort of “future”, such as modal verbs, imperatives, and certain verb complements. For example:

³ *Yiwei* and *renwei* can be both translated as “think”. The difference between them is that *yiwei* has a non-factive implication. The use of *yiwei* indicates that the embedded proposition is false in the actual world. For example:

Zhangsan *yiwei* wo qu kan dianying le.
 Zhangsan think I went see movie PRF
 Zhangsan thinks that I went to see a movie. (But he is wrong. I didn’t go.)

- (12) Wo hui mai ge shenme dongxi gei ta.
 I will buy CL what thing give him.
 I will buy something for him.
- (13) Ni yinggai zuo dianr shenme.
 You should do a-little what
 You should do something.
- (14) Qu kan ge shenme dianying ba⁴.
 Go see CL what movie PAR
 Go see some movie.
- (15) Wo dasuan zuo dianr shenme.
 I plan do a-little what
 I plan to do something.

In (12), the modal verb *hui* (“will”) licenses the existential reading. It indicates a future situation. In (13), the licenser is the modal verb *yinggai* (“should”). Other modal verbs like *bixu* (“must”), *dei* (“have to”), and *keyi* (“may”) are also licensors. In (14), it is an imperative sentence that licenses the existential reading. In (15), the licenser is the main verb. One peculiar aspect about Group C is that in most cases the *wh*-indefinites should be preceded by either a classifier or some quantitative phrase, e.g. the classifier *ge* in (12) and (14), and the quantitative phrase *dianr* in (13) and (15). Lin (1998b) points out that this is not an inviolable rule. Thus he seems to suggest that it is not the classifier or the quantitative phrase that licenses the existential reading. This requirement might be some co-occurrence requirement of these licensing environments.

⁴ This sentential particle indicates that it is a suggestion, rather than a command.

These are the three groups of licensing environments for existential wh-indefinites in Mandarin. However Lin's (1998b) classification seems rather unsystematic. Although Group A can be said to be NPI licensing environments, the other two groups shares many similarities with Group A in many aspects. I will propose to reclassify these different environments into non-modal and modal ones. Non-wh questions are non-modal environments. All of the rest are somewhat modal. Conditionals can be interpreted as a "necessity operator" which quantifies over certain possible worlds. Group B are all epistemic modals, and Group C are all modals as well. The future modal is a kind of necessity. The imperatives involve deontic modals. Then what about negations in Group A? I will argue that negation is not a typical licensing environment, and hence should be treated separately.

Both Li (1992) and Lin (1998b) notice that existential wh-indefinites under negation have another meaning besides the normal existential one. For example:

- (16) Wo mei mai shenme.
 I not buy what
 (a) I didn't buy anything.
 (b) I didn't buy anything special.

The sentence (16) has another reading that I bought something, but it is insignificant. For example, I went to a clothing store, but only bought a pair of cufflinks. If someone asks me what I bought, I can reply with the sentence in (16). Although Li (1992) and Lin (1998b) both ignore this reading, I think this reading suggests that the negation-wh pattern should not be treated equally as just another licensing environment. First, in most cases such sentences are answers to a wh-question. For example:

(17) Q: Ni mai-le shenme?

You buy-PRF what

What did you buy?

A: Mei mai shenme, (jiu yi-zhi bi).

Not buy what just one-CL pen.

Nothing in particular, just a pen.

If the sentence in (16) is used independently in a piece of narrative, or just as a stand-alone sentence, it sounds a little odd. For example:

(18) ?Zhangsan qu-le yitang shangdian. Zuihou ta mei mai shenme.

Zhangsan go PRF once store finally he not buy what

Zhangsan went to the store. In the end he didn't buy anything.

The reason why (18) does not sound very coherent is that the negation-not patterns are usually used in an answer to a wh-question. Without such a context, it is infelicitous. If the meaning of (16) is needed, then we need a different construction, i.e. the universal construction with *dou*. For example:

(19) Wo shenme dou mei mai.

I what all not buy

I didn't buy anything.

The sentence (19) is unambiguous, and it only has the reading that I bought nothing. I will deal with such universal constructions in Chapter 4. It is sufficient here to show that (16) is not the typical use of (16).

There is however a stronger argument against treating the negation-wh as a standard licensing environment of existential wh-indefinites. According to Lin (1996, 1998b), what pulls all the different licensing environments together is a “non-existence condition”. Lin (1998b) gives the following formulation of this condition.

(20) Non-Entailment-of-Existence Condition on EPWs⁵ (NEEC)

The use of an EPW is felicitous iff the proposition in which the EPW appears does not entail existence of a referent satisfying the description of the EPW.

To illustrate how the NEEC is used, we can take a polarity question for example. A polarity question does not assert whether or not the “something” exists. This is consistent with the NEEC. Now let’s look at (16) again. There is no additional description of the EPW besides that it is a thing. Thus it is just interpreted as “something”. But clearly (16) implies that there exists a referent of this “something”. Although this is not an entailment relation, it is an uncancellable implicature. For example:

(21) ??Wo mei mai shenme, qishi wo shenme dou mei mai.

I not buy what actually I what all not buy

??I didn’t buy anything, and in fact I bought nothing.

The reason why (21) sounds odd is that the first sentence implies that I bought something, while the second sentence denies this implicature. Thus such negation-not

⁵ Lin (1996, 1998) uses the term Existential Polarity Wh-phrases (EPW) to refer to the existential readings of wh-indefinites in Mandarin.

patterns always imply the existence of a referent satisfying the description of the EPWs⁶. Although it is not a direct challenge to the NEEC, uncancellable implicature comes quite close to the entailment condition. If we take (16) to be the typical use of such patterns, they need to be treated separately from the other licensing environments. Therefore for my discussion in this chapter, I will not talk about negation as a licensing environment.

There is one more aspect to the licensing of existential wh-indefinites that I want to point out. As I have shown in Section 2.7 of Chapter 2, no existential wh-indefinite can be accented. For example:

- (22) Ta **KANDAO** shenme le
 He see what PRF
 He saw something.
- (23) Ta kandao **SHENME** le
 He see what PRF
 What does he see?

In (22) the main verb is the phonologically the most prominent, and the wh-indefinite has to be phonologically very weak. In (23) the wh-indefinite is the most prominent, as has been discussed in much detail in Chapter 2. This sentence is a wh-question. Thus the lack of phonological prominence suggests that it plays an important role in the licensing of such existential wh-indefinites. Previous studies have not incorporated this phonological aspect. I will argue that the lack of phonological prominence is related to deletion of features.

⁶ What I suggest here is that the domain restriction of the EPW *what* (“something”) shows some narrowing and widening. In the negation-not pattern, the wh-indefinites have a narrower domain of quantification, while the implicature widens this domain.

Now I want to sum up my discussion so far. Based upon the observation of the licensing environments in Lin (1996, 1998b), I categorize these environments into modal and non-modal ones. The latter includes non-wh questions and negation. But due to the special uses of the negation-wh patterns, I will not discuss them in this chapter. I also point out that the lack of phonological prominence is obligatory on the existential readings. In the rest of this chapter, I will illustrate how the compositional semantics of the Alternative Semantics theory sheds light on the licensing of such existential readings and the special phonological property.

3.2 Non-local Existential Closure

In the Alternative Semantics theory, wh-indefinites contribute a set of alternatives, and this set keeps expanding. If it expands to the root of the sentence, then by default it derives a question meaning. If it reaches a quantifier, then the set can be either universally or existentially closed. In this section I will talk about the modal licensors of the existential wh-indefinites. I will argue that the modal introduces an existential closure on the set of alternatives. The modal can also check off the features carried by the wh-indefinites, and this leads to the lack of phonological prominence, and it also explains why the existential closure cannot be introduced above the modal.

First, let's take a typical modal licensor *keneng* ("possibly") as an example.

- (24) Zhangsan *keneng* **MAI**-le shenme.
 Zhangsan possibly buy-PRF what
 Zhangsan probably bought something.

In (24) the modal adverb *keneng* c-command the wh-indefinite, and the main verb is phonologically the most prominent. Now suppose the LF of (24) is (25).

(25) [CP possibly [IP Zhangsan mai-le shenme]]

According to the Alternative Semantics, the denotation of *shenme* and the IP is as follows:

(26) $\llbracket \text{shenme} \rrbracket^{w,g} = \{x \in D_e : \text{thing}(x)(w)\}$

(27) $\llbracket \text{Zhangsan mai-le shenme} \rrbracket^{w,g} =$
 $\{p : \exists x[\text{thing}(x)(w) \ \& \ p = \lambda w'. \text{dance}(x)(w')]\}$

For the semantics of modals, Kratzer (1991) argues that modals are interpreted relative to a modal base and an ordering source. But for my current purposes, the standard modal logic analysis is enough. The standard semantics of the possibility modal given by Kratzer (1991) is:

(28) $\llbracket \text{can } \alpha \rrbracket^f = \{w \in W : w' \in \llbracket \alpha \rrbracket^f, \text{ for some } w' \text{ such that } wR_f w'\}$

Modal interpretations are always relative to a conversational background. An epistemic conversational background can be provided by phrases like “what we know”, which assigns to every possible world the set of propositions we know in that world. Therefore generally the conversational background is a function f which assigns to every member of W a subset of the power set of W . $\llbracket \alpha \rrbracket^f$, if it does not contain a modal, gives the set of possible worlds in which α is true. R is the accessible relation. A world w' is epistemically accessible from a world w if and only if w' is compatible with everything we know in w . The importance of the function f is to determine a unique accessible relation R_f as follows:

(29) For all $w, w' \in W$: $w R_f w'$ iff $w' \in \cap f(w)$

Thus the meaning of (28) is a set of worlds w (or a proposition), and there is an epistemically accessible world w' from w in which α is true. Now in order to combine (27) and (28), we need to close the set of alternatives by applying the propositional quantifiers such as:

(30) Proposition closure

Where \mathcal{A} is a set of propositional alternatives,

a. $\llbracket \exists \rrbracket^w(\mathcal{A}) = \{\lambda w'. \exists p \in \mathcal{A} \ \& \ p(w')\}$

b. $\llbracket \forall \rrbracket^w(\mathcal{A}) = \{\lambda w'. \forall p [p \in \mathcal{A} \rightarrow p(w')]\}$


Although there are two possible choices for closing the alternative set, the default solution is existential closure, as argued in Heim's (1982) semantics of indefinite noun phrases. Therefore by introducing an propositional existential closure below the modal operator, we get the correct compositional semantics, as shown in (31).

(31) $\llbracket \text{possibly } \exists \text{ Zhangsan mai-le shenme} \rrbracket^f$
 $= \{w \in W: w' \in \llbracket \{\lambda w''. \exists p \in \{p: \exists x[\text{thing}(x)(w) \ \& \ p = \lambda w'''. \text{dance}(x)(w''')]\} \ \& \ p(w'')\} \rrbracket^f, \text{ for some } w' \text{ such that } w R_f w'\}$
 $= \{w \in W: w' \in \{\lambda w''. \exists p \in \{p: \exists x[\text{thing}(x)(w) \ \& \ p = \lambda w'''. \text{dance}(x)(w''')]\} \ \& \ p(w'')\}, \text{ for some } w' \text{ such that } w R_f w'\}$

Suppose the set of alternatives contributed by *shenme* include three individuals a , b , and c . Then the semantics in (31) allows the referent of the existential wh-indefinite to

vary from world to world. For example it is allowed that Zhangsan saw a in w_{16} , but Zhangsan saw b in w_{20} , and etc, as long as there is someone that Zhangsan saw in the accessible worlds. This is so because existential closure is introduced under the possibility operator, and it therefore takes narrow scope with respect to the modal operator.

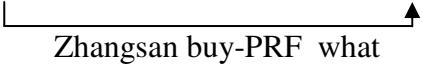
Now what about the phonological properties of such existential readings? Recall that I have argued in Chapter 2, following Haida (2008), that wh-indefinites in Mandarin carry a default [wh] feature and a default focus feature. The focus feature projects as the alternative expands. The phonological prominence comes from this focus feature. Then it is only expected that the deletion of this focus feature will lead to lack of phonological prominence. Now the task is to figure out what element in the derivation deletes this focus feature. The first possibility is the existential closure. The mechanism can be represented as in (32).

$$(32) \quad [\text{possibly } \exists \text{ [Zhangsan mai-le shenme}_F\text{]}]$$



The diagram shows a horizontal line with a vertical tick at the left end (under the existential quantifier symbol) and an arrowhead at the right end (pointing to the focus feature 'F' on the wh-indefinite).

The existential quantifier deletes the focus feature on the wh-indefinite. Since the relation is not local, we might want to resort to some sort of movement, e.g. feature movement à la Pesetsky (2000). Note also that the focus feature projects to the IP level, and after the deletion of the focus feature on the wh-indefinite, the projected focus features should also be deleted somehow. I will leave the details of this checking process for future studies, and will not deal with it here in this chapter.

But the mechanism in (32) will yield wrong readings. For example, it is entirely reasonable to assume that existential closure can apply at the CP level by default, as is common with indefinite NPs. Therefore the following sentence should also get an existential reading.

- (33) $*[\exists [\text{Zhangsan mai-le shenme}_F]]$

 Zhangsan buy-PRF what
 Intended reading: Zhangsan bought something.

Existential closure could apply here to yield an existential reading, and then the existential quantifier can delete the focus feature. But this is not the case. On the other hand, if the existential quantifier can delete the focus feature, then why is there a need for a licenser? Therefore I suggest a second solution, i.e. the licenser deletes the focus feature on the wh-indefinites. Thus instead of (32), we have the mechanism in (34).

- (34) [possibly $\exists [\text{Zhangsan mai-le shenme}_F]$]


The licenser modal introduces an existential closure, and deletes the focus feature on the wh-indefinite and the projected features. The requirement of deleting this feature might be due to the conflict of focus feature with the existential reading. Then the ungrammaticality of (33) is readily explained since the focus feature will not be deleted if there is no licenser.

The compositional semantics illustrated above can cover the following licensing environments: epistemic modals, inference *-le*, imperatives, modal verbs and the modal verb *hui*, since these all involve some kind of sentential modal operators such as the possibility and necessity operators. Next I illustrate how existential closure is introduced in nonfactive epistemic verbs. Take the following sentence for example:

- (35) Zhangsan hai yiwei Lisi xihuan shei ne.
 Zhangsan still think Lisi like who PAR
 Zhangsan thinks that Lisi likes someone.

The verb *yiwei* is the licenser. I added the adverb *hai* and the sentential particle *ne* to make the sentence sound better, although without these words, the sentence is still good when the context is right. I will ignore the contribution of *hai* and *ne* in the compositional semantics. Now the semantics of the matrix verb and the embedded clause can be formulated as (36) and (37) respectively.

$$(36) \quad \llbracket x \text{ yiwei } \alpha \rrbracket^{w,g} = \text{for all } w' \text{ such that } w' \text{ is compatible with what } x \text{ believes in } w, \alpha(w')$$


$$(37) \quad \llbracket \text{Lisi xihuan shei} \rrbracket^{w,g} = \{p: \exists x[\text{person}(x)(w) \ \& \ p = \lambda w'.\text{like}(x)(l)(w')]\}^7$$

Now it does not make sense to say a set of propositions is true in a certain world, if we just put (36) and (37) together. Therefore existential closure is needed. The compositional semantics can proceed as follows:

$$\begin{aligned} (38) \quad & \llbracket \text{Zhangsan yiwei } \exists \text{Lisi xihuan shei} \rrbracket^{w,g} \\ &= \text{for all } w' \text{ such that } w' \text{ is compatible with what Zhangsan believes in } w, \\ & \quad (\exists \text{Lisi xihuan shei})(w') \\ &= \text{for all } w' \text{ such that } w' \text{ is compatible with what Zhangsan believes in } w, \\ & \quad (\exists \{p: \exists x[\text{person}(x)(w) \ \& \ p = \lambda w''.\text{like}(x)(l)(w'')]\})(w') \\ &= \text{for all } w' \text{ such that } w' \text{ is compatible with what Zhangsan believes in } w, \\ & \quad (\lambda w''. \exists p \in \{p: \exists x[\text{person}(x)(w) \ \& \ p = \lambda w'''.\text{like}(x)(l)(w''') \ \& \ p(w'')]\})(w') \\ &= \text{for all } w' \text{ such that } w' \text{ is compatible with what Zhangsan believes in } w, \\ & \quad \exists p \in \{p: \exists x[\text{person}(x)(w) \ \& \ p = \lambda w'''.\text{like}(x)(l)(w''') \ \& \ p(w')]\} \end{aligned}$$

⁷ Suppose the person *l* is Lisi, i.e. the denotation of Lisi is *l*.

The final step in the above derivation yields the right truth conditions, i.e. for all possible worlds that are compatible with what Zhangsan believes in the actual world, one of the propositions in the alternative set is true in that possible world. In terms of the phonological properties of such sentences, again the licenser, i.e. the epistemic verbs can delete the focus feature on the wh-indefinites. For example:

$$(39) \quad [\text{Zhangsan yiwei} [\exists \text{Lisi xihuan shei}_F]]$$


Such intensional verbs are not usually called modals, but since they involve universal quantification over possible worlds, which is similar to the necessity modal, I will use the term “modal” to refer to these intensional contexts here. The compositional semantics illustrated above can cover the following cases of licensing environments: the nonfactive epistemic verbs, the verb complements in Lin’s (1998b) Group C.


Now the only modal environment left to be explained is if-clauses. The idea is that conditionals involve a certain kind of necessity operator over possible world, and therefore I refer to this environment also as modal. For example:

$$(40) \quad \begin{array}{l} \text{Yaoshi ni} \quad \text{kanjian shei, jiu} \quad \text{gaosu wo.} \\ \text{If} \quad \text{you see} \quad \text{who then tell} \quad \text{me} \\ \text{If you see someone, let me know.} \end{array}$$

A simplistic version of the possible worlds semantics for conditionals can be used here to illustrate the introduction of the existential closure.

$$(41) \quad \llbracket \text{yaoshi } \alpha, \beta \rrbracket^{w,g} = \text{for all } w' \text{ such that } wRw' \text{ and } \alpha(w'), \beta(w').$$

Now the situation is the same as before when we try to do the compositional semantics, and we need the existential closure in the restriction clause of the conditional, as shown in (42).

$$(42) \quad [\text{yaoshi } [\exists \text{ni kanjian shei}_{\text{F}}], [\text{jiu gaosu wo}]]$$


The conditional operator introduces an existential quantifier and deletes the focus feature on the wh-indefinite.

So far I have shown for all the modal environments that license existential wh-indefinites the modal operator introduces an existential quantifier whenever it is needed, and delete the focus feature on the wh-indefinites. As for the [wh] feature, I assume that they are deleted somehow. But since the effect of this deletion is not obvious either phonologically or syntactically, I will not go into details of how this feature is deleted.

Jo-Wang Lin (2004) notices that the existential readings of wh-indefinites show some scope variability when there are more than one potential licenser. For example:

- (43) Haoxiang [yaoshi shei bu qu de-hua, Zhangsan jiu bu qu] de-yangzi
 Seem if who not go if Zhangsan then not go seem
- a. It seems that if anyone does not want to go, Zhangsan won't go.
 - b. It seems that somebody is such that if he does not want to go, then Zhangsan won't go.

I think the scope variability shown in (43) is genuine. The first reading, i.e. (43a), is one where the existential takes the narrowest scope. The second reading, i.e. (43b), is one

where the existential takes scope in between “seem” and “if”. This scope variability reveals the location of the existential closure. As I have argued above, the existential closure is applied where needed for interpretation purposes. If there are two modals, then theoretically the existential closure can apply under each modal, when the context is right.

To sum up this section, I have shown that the modal licensors introduce a propositional existential quantifier and deletes the focus feature on the wh-indefinites. If no existential quantifier is introduced, the alternative just keeps expanding until (i) it reaches another modal which existentially closes the alternative, and it takes a certain kind of “intermediate scope”, or (ii) it reaches the CP level of the sentence and yields a wh-question with focus intonation on the wh-indefinites.

3.3 Local Existential Closure

In this section, I illustrate how the non-modal environments license existential readings of wh-indefinites locally. The central idea is that a generalized quantifier is formed directly on the wh-indefinites.

First, let us look at A-not-A questions. For example:

- (44) Zhangsan mai-mei-mai shenme dongxi?
 Zhangsan buy-not-buy what thing
 Did Zhangsan buy anything?

In (44), the only possibility of existential closure is directly above the wh-indefinite phrase. Although the A-not-A seems to be a licensor, let’s suppose for the time being

that the existential closure can be applied anywhere in the derivation. Consider the following two possibilities⁸.

(45) Zhangsan mai-mei-mai \exists shenme dongxi?

(46) \exists Zhangsan mai-mei-mai shenme dongxi?

First let's work out the compositional semantics of (45). Since the existential closure is directly introduced above the wh-phrase, it essentially turns the whole wh-phrase into a generalized quantifier. Then it composes with the alternative set contributed by the A-no-A part, and the final product of the derivation is a polarity question that contains a generalized quantifiers in the object position, as shown in (47). There is no problem with the compositional semantics.

(47) {Zhangsan mai-le \exists shenme dongxi ;
Zhangsan mei mai \exists shenme dongxi}

Now let's look at how the compositional semantics of (46) will proceed. First suppose the set of alternatives introduced by the wh-indefinite phrase and the A-not-A part is (48) and (49) respectively.

(48) {a, b, c}

(49) {x bought y; x did not buy y}

⁸ Another possibility to apply the existential closure is at the VP level, i.e. right above the A-not-A verbal complex. However, after the existential closure, there is some complications as to how the external argument can be incorporated into the formula. At least we need a lambda abstraction of the variable inside each of the proposition in the alternative set. Then where can we get this lambda abstraction? It is not clear to me right now. Therefore I am not considering this possibility here.

Since there is no existential closure at this step, we need to compose the above two sets into one alternative set using the Image Construction Functional Application rule. Then by another application of the same rule, we get the following set of propositions:

- (50) {z bough a; z bought b, z bought c;
z did not buy a; z did not buy b; z did not buy c}⁹

Then existential closure is applied here. We get a set of worlds where one of the propositions in (50) is true. The problem is that the final product is not a question anymore. Moreover an existential closure on the set in (50) is almost. It is not clear what it actually means.

But if no existential closure is introduced at all in the whole derivation, then we get a multiple question reading, although the set of alternatives lacks certain order. Such a multiple question reading is indeed available. Suppose that we have a list of people in front of us, and you want to know about each person whether I like him/her or not. But I want to say that it is none of your business, and then I can use the following sentence.

- (51) Wo xi-bu-xihuan shei gen ni mei guanxi?
You like-not-like who with you not-have relation
It is none of your business whether for each person I like him/her or not?

A direct matrix question does not sound as good as when such a multiple question is embedded as in (51). But it shows that a multiple question is possible.

⁹ The individual z is the denotation of *Zhangsan*.

Therefore the compositional semantics only allows the existential closure to be applied directly above the wh-indefinites. The representation in (45) is the only choice. This existential quantifier resembles the Japanese *-ka* in the existential readings of wh-indeterminate phrases. This *-ka* is attached directly to the wh-phrase to yield a generalized existential quantifier. The difference between the Japanese indeterminate phrase and Mandarin wh-indefinites is that both local and non-local existential closure are allowed in Mandarin, while only the local option is allowed in Japanese.

I will argue that the local existential closure in Mandarin turns the wh-phrase into a generalized quantifier and deletes the focus feature at the same time.

Therefore the argument so far can be summarized as:

- (52) Existential closure condition
 - (i) Existential closure applies as late as possible
 - (ii) Local existential closure deletes the focus feature
 - (iii) Non-local existential closure cannot delete the focus feature.
 - (iv) Modal operators can delete focus features.

In the modal environments we have seen, the alternative set does not have to be closed locally, and therefore non-local existential closure is applied in the right contexts, and then a c-commanding licenser is needed to delete the focus features. In A-not-A questions, the only possibility of existential closure is local. According to the condition in (52), the modal operators are licensors in that they delete the focus feature on the wh-indefinites, and the A-not-A verbal complex is a licenser in that it creates a configuration where existential closure has to be applied locally, if it is applied at all.

This condition allows subject wh-indefinites to be closed locally, since the compositional semantics is essentially the same as with object wh-indefinites.

However, subject wh-indefinites cannot be interpreted as existential. For example:

(53) *Shei xi-bu-xihuan Zhangsan?

Who like-not-like Zhangsan

Intended reading: does someone like Zhangsan.

Previous studies rule such sentences out by the c-command relation between the licensor and the licensee, i.e. the A-not-A and the wh-pronoun here. However, the condition in (52) is a semantic condition. Semantically speaking, the A-not-A creates the same licensing environment for the subject wh-pronoun. Therefore such cases need to be ruled out by other conditions in the grammar. One possible solution is probably due to the linear ambiguity of the existential quantifier. Suppose we have:

(54) [\exists shei xi-bu-xihuan Zhangsan]

Then the existential quantifier can be either attached to the wh-pronoun or the whole IP. Such structural ambiguity doesn't arise in the object wh-indefinite cases.¹⁰

Now I will show that the condition in (52) can explain other types of questions in terms of the licensing of existential readings of wh-indefinites.

I have argued that polarity questions and VO-not questions are the same because the question particle *–ma* essentially is an abstract negation for both *mei* and

¹⁰ Another reason might be phonological. The VP forms a prosodic unit, and the contrast between the verb and the object DP indicates the lack of phonological prominence on the object wh-indefinites. But for subject DPs, there is no direct prosodic unit that can create such a contrast. Therefore the lack of phonological prominence is harder to achieve in the subject position.

bu. I'll look at these two types of questions together. According to the condition in (52), it is possible to apply existential closure at the local level or at the IP level. If the existential closure is applied at the IP level, then we will have a problem with semantic composition at the VP level. The function of the negation and the particle *ma* is to take a function and return a negated function. If the object wh-indefinite expands to the first VP level and yields a set of functions, then the negation will not be able to operate on a set of functions. Therefore existential closure must be applied locally.

The licensing of wh-indefinites as existentials in polarity questions also lend support to my claim that the particle *ma* is not a question particle. Suppose the particle *ma* is a question particle as claimed by Cheng (1991). Then it should be able to license a subject wh-indefinite as existential, but it cannot. For example:

(55) **shei xiang chi pingguo ma?*

Who want eat apple Q

Intended reading: does anyone want to eat apples?

Cheng (1991) explains the ungrammaticality of (55) in terms of Diesing's (1992) Mapping Hypothesis, according to which existential closure only applies at the VP level. Thus the subject DP variable will not be existentially closed. But consider my proposal that the particle *ma* is a generic/abstract negation at the VP level. Then the particle does not c-command the subject wh-indefinite anymore. Thus in a syntactic theory of the licensing conditions of existential wh-indefinites, the problem with subject wh-indefinites follows very naturally from the syntactic configuration. Although in my semantic licensing condition, subject wh-indefinites have to be

accounted for by other conditions, it nonetheless indirectly lends support to my proposal about the particle *–ma*.

Now let's look at wh-questions with respect to licensing existential readings. The observation is that wh-questions do not license existential readings of other wh-indefinites. For example:

- (56) Shei xihuan shenme
 Who like what
 Who likes what?

The sentence in (56) only has a multiple wh-question reading. Neither of the two wh-phrases can be existential. This follows naturally from the semantic licensing condition in (52). First, there is no compositional problem with introducing the existential closure at the IP level. Therefore according to the condition that existential closure should be applied as late as possible, we may introduce an existential quantifier at the IP level, which yields the following representation.

- (57) [\exists [shei xihuan shenme]]

This is a reading where both wh-indefinites are existential. However this existential closure is non-local, and according to the semantic condition, non-local existential closure needs a licensor to delete the focus feature. There is no such licensor in (57). Thus such a reading is ruled out. On the other hand, if we apply existential closure locally, then we get the following representation:

- (58) [shei xihuan [\exists shenme]]

Although (58) yields the intended reading correctly, it violates the first clause in the semantic condition, because it is possible to introduce the existential quantifier at the IP level without leading to semantic anomaly, as in the case of the A-not-A questions. Therefore the lack of existential readings in multiple wh-indefinites sentences follows naturally from the semantic licensing condition.

Finally alternative questions do not license existential readings of wh-indefinites for the same reason as wh-questions do not license such readings. For example:

- (59) *Zhangsan xihuan shei, haishi Lisi xihuan shei?
 Zhangsan like who or Lisi like who

It is possible to introduce an existential quantifier at the respective IP level, as shown in (60).

- (60) [\exists Zhangsan xihuan shei] haishi [\exists Lisi xihuan shei]?

However, there is licensor to delete the focus features on the wh-indefinites. Although *haishi* is a potential option, the c-commanding relation between *haishi* and the two wh-indefinites is not readily available. Therefore the semantic condition rules out alternative questions.

Now I have shown in detail how existential readings of wh-indefinites can be licensed by a semantic condition, in both the modal environments and the non-modal environment. The compositional semantics in the Alternative Semantics theory is a direct explaining factor behind this semantic condition. The set of alternatives just

expands until it cannot expand anymore. In the next section, I will discuss the interaction between existential readings of wh-indefinites and other quantifiers, especially the universal construction in Mandarin.

3.4 Interaction with Other Quantifiers

Jo-Wang Lin (2004) notices that existential wh-indefinites can interact with a universal quantifier. His example is:

- (61) Haoxiang mei-ge ren dou kandao shenme de-yangzi
Seem every-CL man all see what seem
a. It seems that everyone is such that he saw something.
b. It seems that there is something such that everyone saw it.

The wh-indefinite in (61) can take narrow scope with respect to the universal construction, and yield the reading in (61). It can also take an intermediate scope between *haoxiang* and the universal *mei-ge ren*, and yield the reading in (61). In his paper, he assumes that the wh-indefinite in such licensing environments is just an existential quantifier. Therefore the representation of (61) is actually:

- (62) [haoxiang [mei-ge ren dou kandao [\exists shenme]] de yang-zi.

Then the two quantifier scan enter into scope interaction just like in English, where the following sentence is ambiguous in the same way.

- (63) Everyone saw someone.

However there is a problem with this view of the scope interaction between quantifiers in Mandarin. It has been observed by many that quantifier scope is fixed in surface syntax in Mandarin. For example:

- (64) Meige ren dou you yiben shu.
 Every-CL man all have one-CL book
 Everyone has one book. (a different one)
- (65) You yiben shu meige ren dou you
 Have one-CL book every-CL man all have
 One book is owned by everyone (same book, but different tokens)

In both (64) and (65), the only scope relation is the one that corresponds to the surface order of the two quantifiers. Thus if the two quantifiers in (62) can have a scope relation which is reversed from the surface order, it seems to be at odds with the general observation of scope relations in Mandarin.

On the other hand, in the Alternative Semantics theory, the scope interaction is derived from different level of existential closure. For example, the two scope relations in (61) corresponds to the following two representations:

- (66) [haoxiang [mei-ge ren dou kandao \exists shenme] de yang-zi.
 (67) [haoxiang \exists [mei-ge ren dou kandao shenme] de yang-zi.

If the existential closure is applied locally, then it yields the narrow scope reading. If the existential closure is applied at the immediate IP level, then it is supposed to yield the wide scope reading. But in fact it does not. As has argued by Lin (1998a), universal quantifiers like *meige ren* (“everyone”) in Mandarin are more like definite

DPs in that they introduce a set of individuals. I will show in Chapter 4 that *meige ren* are similar to wh-indefinites in that they contribute a set of alternatives, and the set of alternatives can be closed by the universal quantifier *dou*. Thus take (67) for example. Suppose that *meige ren* contributes a set of individual, i.e. {a, b, c} and *shenme* also contributes a set of things, i.e. {x, y, z}. The set of alternatives is therefore:

- (68) {a saw x; a saw y; a saw z;
 b saw x; b saw y; b saw z;
 c saw x; c saw y; c saw z}

Suppose existential closure applies the set of alternatives in (68). Then we get a reading that says someone saw something, but not the desired reading at all. On the other hand, the universal quantifier *dou* has to apply to *meige ren* as well. Now we have to quantifiers on one set of alternatives, as shown in (69).

- (69) $\exists \forall \{p_1, p_2, p_3, \dots\}$

The structure in (69) is uninterpretable in the Alternative Semantics theory. Thus it shows that either there is no scope interaction between the two quantifiers in (61), or the scope interaction is derived by some special mechanism. Since no one has claimed how a special mechanism can derive such scope interactions, it is better to conclude that there is no scope interaction at all. Then how can we account for the two readings in (69)? Actually the wide-scope reading is a special case of the narrow scope reading. In the narrow scope reading, all the things that were seen do not have to be the same. But if they happen to be the same, then we get a wide scope reading. But this also predicts that the narrow scope reading is the more salient reading. I think it is correct

and for me it is easier to get the narrow scope reading. Jo-Wang Lin (2004) uses the following example to bring out the wide scope reading as a preferred reading.

- (70) Haoxiang meige ren dou shuo yaoshi shei bu qu de-hua,
seem every-CL man all say if who not go if
tamen jiu dou bu qu de-yangzi.
they then all not go seem

It seems that everyone said that if somebody/anybody does not want to go, then they will not go.

Jo-Wang Lin (2004) says that the preferred reading is that “it seems that there is a certain person such that everyone says that if that person does not go, then they will not go.” Indeed this is a wide scope reading of the *wh*-indefinite. But the narrow reading is still available. It is entirely reasonable to say that certain contexts tend to indicate that the individuals denoted by the existential *wh*-indefinite are the same. In this example, the use of *tamen* “they” in the consequent clause of the conditional seems to be where this preference comes from.

Now in terms of both the general scope relations in Mandarin and what the compositional semantics in the Alternative Semantics theory says, it is reasonable to say that existential *wh*-indefinites cannot take wide scope over the universal quantifier in Mandarin. The scope relations are derived from contexts that give rise to a special case where all the individuals denoted by the *wh*-indefinites happen to be the same.

3.5 Summaries

In this chapter, I have explored the applicability of the Alternative Semantics theory to the existential readings of *wh*-indefinites in Mandarin. The general idea is

that the set of alternatives keeps expanding until they reach a binder or the top level of the sentence. I categorize the licensing environments of existential wh-indefinites into modal and non-modal ones. In modal environments, existential closure is applied at the IP level, and the modal also deletes the focus feature on the wh-indefinites, thus deriving the phonological properties of such wh-indefinites. In non-modal environments, the existential closure is applied locally and the focus feature is deleted by the existential quantifier. I formulize these ideas into a semantic licensing condition, which can explain a majority of the data.

On the other hand, the compositional semantics is also a driving factor behind various phenomena. The local application of existential closure is motivated by concerns with semantic composition. If existential closure is applied non-locally, it leads either to semantic anomaly or redundant focus features on existential wh-indefinites. The compositional semantics also helps in deciding whether existential wh-indefinites can enter scope interaction with universal constructions. Wide scope for the existential wh-phrase leads to uninterpretability in terms of the compositional semantics. Thus it shows that the wide scope is derived rather as a special case of the narrow scope.

So far I have discussed the interrogative and existential interpretations of wh-indefinites in Mandarin in the framework of the Alternative Semantics theory. This theory has been shown to shed light on a variety of phenomena. In the next chapter, I will apply this same theory to the universal interpretations of wh-indefinites in Mandarin Chinese.

CHAPTER 4

TWO TYPES OF UNIVERSAL CONSTRUCTIONS

The wh-indefinites in Mandarin can have interrogative, existential and universal interpretations depending on the context and the kind of operators that they are associated with. In Chapter 2 I talked about how the interrogative readings of wh-indefinites are accounted for in the Alternative Semantics theory. In Chapter 3 I extend this theory to existential readings. Now in this chapter, I am going to discuss the universal readings of wh-indefinites in Mandarin. The universal readings of wh-indefinites are derived by association with an adverb of quantification *dou* (“all”). I will call this the *wh...dou* construction. There is another universal construction, which is built by associating a *mei*-phrase, i.e. “every+NP”, with the adverb *dou*. I will call this construction the *mei...dou* construction. Since these two constructions are very similar, I will deal with both of them here.

First, I propose a “universal concord” analysis of the *mei...dou* construction. In this construction, the *mei*-phrases carry an uninterpretable quantificational feature that has to enter into an agreement relation with the interpretable quantificational feature carried by *dou*. This checking requires that the *mei*-phrases to move to the spec position of the *dou*.

Second, I propose an analysis of the *wh...dou* construction. As has been argued, the wh-indefinites contribute a set of alternatives, and then this set is closed off by the universal quantifier *dou*. The focus feature carried by the wh-indefinites need to be checked off locally by the *dou*, and this triggers the movement of these wh-indefinites to the spec position of the adverb.

The feature checking mechanism of the wh-indefinites used in this chapter is the same as in Chapter 3, where the focus feature on the existential wh-indefinites can

be checked either locally by a quantifier or non-locally by a licensor. In the *wh...dou* construction, the only option is local checking, since there is no licensor for non-local checking. But since the *wh*-indefinites in their base positions are not in a local position, they have to move to the spec position of the *dou* to create a local checking configuration.

I also explain the differences between these two universal constructions. The first difference is that there is no multiple *wh...dou* construction, while multiple *mei*-phrases are possible. I explain this in terms of simultaneous feature checking of multiple NPs. The second difference is that the domain of quantification of the *mei...dou* is narrower than in the *wh...dou* construction. This is a result of the quantificational feature carried by the *mei*-phrase. Quantifiers have contextually determined domain of quantification, while indefinites show domain-widening.

This chapter is structured as follows. In section 4.1, the theoretical issues raised by the two types of universal constructions are described in details. In section 4.2, I discuss the analysis of a series of concord phenomena in the framework of the Alternative Semantics theory, as done by Kratzer (2006). In section 4.3, I propose my “universal concord” analysis of the *mei...dou* construction. Kratzer (2006) gives examples of negative concord, existential concord, and she speculates that there must be universal concord. I show that the Mandarin *mei...dou* construction is exactly what she is looking for. In section 4.4, I propose an analysis of the *wh-dou* construction, along the same lines as the *mei...dou* construction. In both of these two sections, I will explain why there is obligatory movement in the Mandarin universal constructions, in terms of feature checking. In section 4.5, I discuss some differences between these two types of universal constructions. In section 4.6, I summarize the points made in this chapter.

4.1 Universal Constructions in Mandarin

In Mandarin, there are two major types of universal constructions. The most common one is the *mei...dou* construction, and the second type is formed with a wh-indefinite and the adverb of quantification *dou*¹. For example:

- (1) Meigeren dou xihuan chi pingguo.

Everyone all like eat apple

Everyone likes to eat apples.

- (2) Shenme-ren dou xihuan chi pingguo.

What-person all like eat apple

All people like to eat apples.

These are typical examples of universal constructions in Mandarin, and there are many issues to be accounted for with respect to the syntax and semantics of these two types of universal constructions.

First, let's discuss briefly what problems the *mei...dou* construction poses. In example (1), *meigeren* is morphologically analyzable as *every-classifier-person*, and the adverb of quantification *dou* is usually translated as “all”. The puzzle here is that there are two universal quantifiers that are related to the same NP, i.e. *mei* “every” and *dou* “all” both related to the NP *ren* ‘person’ in one construction. This is quite different from the textbook examples of universal quantification, where only one universal quantifier is used. Moreover, *dou* is obligatory in most cases, and *mei* alone without *dou* often results in ungrammaticality. For example:

¹ In the negated form of this universal construction, both the adverb *dou* and the adverb *ye* (“also”) are allowed. But I will concentrate on the use of *dou* in this chapter.

(3) *Meigeren xihuan chi pingguo.

Everyone like eat apple

Intended reading: everyone likes to eat apples.

In the standard logic representation of generalized quantifiers, “everyone” is often given the semantics as in (4):

$$(4) \llbracket \text{everyone} \rrbracket(P) = \forall x. [\text{person}(x) \rightarrow P(x)]$$

The symbol “P” represents a one-place predicate. In semantic terms, it denotes a property. In the formulation in (4), the property P is true of each person x. In this sense it is distributive.

As for the semantic contribution of the adverb *dou*, many Chinese linguists claim that it is a distributivity operator, similar to the floating quantifier “all” in English in Link’s (1987) analysis. A simplistic version of the semantics for *dou* can be formulated as in (5)².

$$(5) \text{dou} \rightarrow \lambda P \lambda X \forall y[y \in X \rightarrow P(y)]$$

The symbol P is again a one-place predicate, and it denotes a property. The symbol “X” is a plural NP, and it denotes a plural individual, which is an ordered set of sets of individuals in the sense of Link’s (1983) lattice-theoretic representation of plurality. The symbol “y” is a variable over singular atomic individuals. Thus the semantics of this distributivity operator assigns the property to each atomic individual.

² This is the first version of Lin’s (1998a) semantics of the distributivity operator. He continues to improve on this version throughout his paper. Here I just use the first version to point out the problem with multiple application of the distributivity algorithm.

As we can see from (4) and (5), the universal quantifier and the distributivity operator are very similar since in some sense they are both distributive. If the Mandarin *mei* is indeed a universal quantifier, then there will be a problem with the compositional semantics of the *mei...dou* construction, because there will be two applications of the same distributivity algorithm, and the second time it is applied, there is no plural entities for the distributivity to apply to.

The semantics and the co-occurrence requirement of *mei* and *dou* have been a long-standing problem in Chinese linguistics. Some linguists try to align this construction with the standard universal construction found in logic textbooks, e.g. Lee (1986). Some linguists try to keep the semantics of the distributivity operator *dou* and alter the semantics of *mei* in Mandarin so that there will be no conflict between the semantics of these two quantifiers, e.g. Lin (1998a). Some linguists propose to analyze the *mei...dou* construction in a totally different semantic framework. For example, Huang (1996) argues that the *mei* construction alone gives a set of minimal events, and *dou* is a sum operator on these events. Thus in her theory, the two universal quantifiers are applied to different semantic entities. Which of these theories are right? This is one of the central topics of this chapter. I will actually show that each of these three approaches is right in some sense, and building upon a proposal made by Lin (1998a) at the end of his paper, I will argue that *dou* is a propositional universal quantifier, and the co-occurrence requirement in the *mei...dou* construction is actually a case of universal concord as mentioned briefly in Kratzer (2006).

Second, let's look at the second type of universal constructions in Mandarin, i.e. the *wh-dou* construction. As I have shown in Chapter 2, this construction allows for both a universal reading and a free-choice reading. It is up to the context to decide which of these two readings is salient. Therefore in this chapter, I will discuss the universal readings of this construction, in comparison to the *mei...dou* universal

construction. I will not discuss the semantics and pragmatics of the free-choice reading. Now we see there are two universal constructions in Mandarin. Then the question to ask is what differences there are between these two constructions? Are these differences syntactic or semantic in nature and where do they arise?. In this chapter, on the one hand, I will show that the *wh-dou* construction differs from the *mei...dou* construction in at least two ways. First, as shown in the previous two chapters, *wh*-indefinites in Mandarin do not have any quantificational force, and they only introduce a set of individual alternatives. In contrast, the *mei*-phrase has quantificational force. Second, the domain of the *wh*-indefinites is wider than in the *mei...dou* construction. This follows from the lack of quantificational force of the *wh-dou* construction. On the other hand, Shimoyama (2006) discusses the *wh-mo* construction in Japanese as a universal construction, which is similar to the *wh-dou* construction in Mandarin. However, there is one important difference between the *wh...dou* construction in Mandarin and the *wh...mo* construction in Japanese. In Mandarin, the *wh*-phrase has to move to the left of *dou*, while in Japanese there is no such requirement. I will explain this in terms of checking off the focus feature on *wh*-indefinites in Mandarin.

4.2 Concord Phenomena in the Alternative Semantics

Before discussing the solutions for the issues posed by the *mei...dou* construction in Mandarin, I want to show what I mean by “concord”, and how they are accounted for in the Alternative Semantics theory.

In the previous two chapters, I have shown how the Alternative Semantics theory can help us to understand the quantificational variability of *wh*-indefinites better. Although this theory is originally based on *wh*-indefinites, its applicability does not stop there. It can be regarded as a general theory of indefinite NPs. Therefore Kratzer (2006) extends this theory to other types of indefinite NPs. She proposes that

all indefinite NPs, e.g. wh-indefinites and NPs that have the indefinite determiner “a/an”, lack quantificational force, and their semantic contribution is a set of individuals. The compositional semantics of indefinite NPs relies on the Image-Construction Functional Application rule. One of the advantages of looking at all indefinite NPs as in the Alternative Semantics is that we have a straightforward explanation of a series of concord phenomena. Kratzer (2006) discusses two such cases: one is negative concord, the other is existential concord. For example, in some non-standard German variety, there is a phenomenon called “negative concord”, where multiple negations appear in one sentence but do not lead to multiplication of the negation operator. For example:

(6) Ich hab’ **keine** Fehler **nicht** gemacht

I have no mistake not made

I didn’t make any mistakes

In (6) a negative quantifier occurs in the scope of negation, but it does not lead to double negation. The problem with this kind of phenomena is that both of these negative words seem to carry some meaning of negation. Thus one possible solution is that not all of these negative words are interpreted as negation. Maybe only one is interpreted as negation, or maybe none of them is interpreted as negation at all, and they all have to agree with a covert sentential negation. This is called Negative Concord. It is a much more common phenomenon in the Romance languages, e.g. Spanish. If we adopt the alternative semantics for indefinites, then such concord phenomena are only expected. In this theory, “keine Fehler” only denotes a set of entities, with no quantification force, and then by combining this set with a propositional negation operator, the desired semantics would be yielded. As for the

meaning of negation in “keine”, it is only a negative feature that agrees with the propositional negation operator. Furthermore, negative concord with multiple indefinites is also possible as in (7)

(7) Ich hab’ **keinem** Mensch **kein** Wort **nicht** gesagt.

I have no-dat person no word not said

I didn’t say anything to anybody.

According to Kratzer (2006), the negative quantifiers “(and possibly even that of *nicht*), would be the expression of agreement with an abstract element of clausal structure, propositional [Neg].” (p19). She leaves the interpretation of “nicht” open, and does not rule out the possibility of “nicht” being the sentential [Neg]. This might not be the case in German, but it could be possible in other languages, i.e. the operator that triggers the agreement relation does not have to be covert. I will argue that in the universal concord phenomenon in Mandarin, *dou* is actually a propositional operator.

Kratzer (2006) gives the following example of existential concord:

(8) Du musst **irgendwem** **irgendwas** schenken.

You must irgend-one-dat irgend-thing give

You must give something or other to somebody or other as a gift.

In (8), similar to the negative concord in (7), both indefinites are related to a sentential existential quantifier, and the “irgend” part is an expression of agreement with the covert existential quantifier. Let’s look closer at example (8) to see what ‘existential concord’ actually means. There are two indefinites, i.e. ‘irgendwem’ (‘someone’) and ‘irgendwas’ (‘something’). If they are treated as generalized quantifiers, then there

will arise a scope difference. If ‘irgendwem’ takes scope over ‘irgendwas’, then we get a reading that there is someone that you give something to. If ‘irgendwas’ takes scope over ‘irgendwem’, then we get the reading that there is something that you give to someone. Neither of these two readings involves free choice on both ‘generalized quantifiers’, and indeed if they are generalized quantifiers it would be very difficult to get a free choice reading on both. The example (8), however, does have a free choice reading that you can give just anything to just anybody. In this reading, according to Kratzer (2006), we have to keep track of both indefinites at the same time. In other words, the alternatives contributed by the two indefinites should be compiled into one set of alternatives, and a free choice from this set of alternatives is allowed. Thus it seems that these two indefinites actually are associated with a covert existential quantifier, which might be introduced together with the modal. This simultaneous check on both indefinites is what the existential concord is about. Although the same effect can be achieved by resorting to unselective binding, the Alternative Semantics can achieve this result in a more intuitive and straightforward way. Moreover as a general theory of indefinites, the Alternative Semantics theory also has advantages in explaining various wh-in-situ phenomena, as I have argued in Chapter 2.

Therefore in these concord phenomena, multiple morphemes for the same semantic interpretation are not all interpreted. Some are interpreted, and those that are not interpreted need to be checked with the interpretable features. As we have seen, the alternative set can be associated with a propositional quantifier like the universal, the existential and negation. In the above examples of negative concord and existential concord, the alternative set is associated with the negation and the existential quantifier respectively. Thus it leaves open the possibility of universal concord, where the set of alternatives is associated with a sentential universal quantifier. Kratzer (2006) briefly mentions this possibility, but does not give any examples. I will show that there

is indeed universal concord, and the Mandarin *mei...dou* construction can be best explained if it is regarded as one such case.

4.3 Universal Concord in Mandarin

As I have shown in Section 4.1, in the *mei...dou* construction, the adverb *dou* is obligatory. Both quantifiers are necessary. The example is repeated here:

(9) Meigeren dou xihuan chi pingguo.

Everyone all like eat apple

Everyone likes to eat apples.

We may refer to this co-occurrence condition as the association between *dou* and *mei*. This association is, however, not totally unconstrained. Although *mei* can occur inside a relative clause to the left of *dou*, as shown in (10), bi-clausal association are not allowed, as shown in the following examples through the comparison between (11) and (12), and the contrast between (13) and (14).

(10) Meigeren xie de shu wo dou kan le.

Everyone write DE book I all look PRF

For all persons x, I read the book that x wrote.

(11) Meigeren dou qu kan dianying zuihao.

Everyone all go see movie best

It will be good that everyone goes to see the movie.

(12) *Meigeren qu kan dianying dou zuihao.

Everyone go see movie all best

Intended reading: same as (11).

(13) Meigeren dou renwei Yuehan xihuan chi pingguo.

Everyone all think John like eat apple

Everyone thinks that John likes to eat apples.

(14) *Meigeren renwei Yuehan dou xihuan chi pingguo.

Everyone think John all like eat apple

Intended reading: same as (13).

In (10), *meigeren* is inside a relative clause, and the association with *dou* is perfectly ok. In (11), *meigeren* is inside a subject clause, and it can be associated with a *dou* in the same subject clause, but not one in the main clause, as shown in (12). In the example in (13), *meigeren* is the subject of the main clause, and it can be associated with a *dou* in the main clause, but not one in the embedded clause, as shown in (14).

To sum up the data, we have at least three things to account for. The first problem is the co-occurrence of *mei* and *dou*. This construction is comparable to saying “every...all” in English. For example:

(15) *Everyone all likes to eat apples.

Apparently, (15) is semantically uninterpretable. But the corresponding Mandarin example is perfectly ok. Therefore there must be something special about the *mei...dou* construction in Mandarin, and they are not equivalent to (15).

The second problem that we need to account for is the movement of the *mei* phrase. As shown in all the examples of this *mei...dou* construction, the *mei* phrase has to appear to the left of the *dou*. In other words, if *meigeren* is base generated in the object position, in most cases it should move to the left of *dou*. For example:

(16) Meigeren Yuehan dou xihuan.

Everyone John all like

John likes everyone.

This is usually called the Leftness Condition in the literature on *dou*. It reminds us of the *wh...dou* construction in (2), where the same Leftness Condition holds. Since they are similar processes, we would expect to account for them in the same way.

The third problem is the Clause-mate Condition, which rules out bi-clausal associations of *dou* and *mei*, as shown above in (10)-(14).

These problems have been challenging for Chinese linguists for a long time, and there has been an abundance of literature on these problems. What I want to contribute to this project of research is to look at these problems within the new framework of the Alternative Semantics theory. This new theory provides a new explanation that might solve long-standing problems with the co-occurrence of *mei* and *dou*. I will argue that the *mei...dou* construction is actually a case of universal concord. Therefore the co-occurrence requirement is a direct consequence of the feature agreement mechanism. Moreover the other two properties, i.e. the Leftness Condition and the Clause-mate Condition, follow naturally from this concord process.

In the rest of this section I will present my analysis of the *mei...dou* construction in terms of universal concord.

As I have said above, *mei* in Mandarin is clearly not equivalent to ‘every’ in English. Lin (1998a) proposes that *meigeren* (“everyone”) in Mandarin actually denotes a set of individuals, and it therefore would have the same denotation as “the men”. In his proposal, *mei* is no longer a universal quantifier of type $\langle\langle e,t\rangle,\langle\langle e,t\rangle,t\rangle\rangle$, but rather of type $\langle\langle e,t\rangle,t\rangle$. It takes a NP predicate and returns

the maximal collection of the individuals denoted by the predicate. The semantics of *mei* he proposes in his paper is:

$$(17) \quad \llbracket mei \rrbracket = \text{that function } f \text{ such that for all } P \in D\langle e, t \rangle, f(P) = \cup \llbracket P \rrbracket$$

From the semantics in (17), we can see that *meigeren* is semantically the same as a plural NP. They resemble indefinite NPs in that they denote a set of individuals in the sense of the Alternative Semantics. There are, however, a few problems with this proposal.

First, *mei* sometimes can occur by itself in certain sentences without *dou*. Thus it does show that the *mei*-phrase is not just a plural NP, and it does carry some universal quantificational force. For example, if *mei* occurs in the object position, and bears the accent for a contrastive meaning, it can stay there without being associated with *dou*, as shown in the sentences below.

(18) *Wo xihuan meiyige xuesheng (without stress on “meiyige”)

I like every student

Intended reading: I like every student.

(19) Wo xihuan MEIyige xuesheng (bold capitals indicate stress)

I like every student

I like every student.

In (18), without the accent on *mei*, the sentence is definitely odd, while on the other hand, an accent that indicates contrast can make the sentence quite acceptable, as shown in (19). The contrastive meaning in (19) can be paraphrased as: I do not just like this student, or that one, and I do not just like a few of these students, but I like

ALL of them. In this case, the universal quantification force can be said to come from the *mei* only, since it is not clear how a contrastive accent can contain a universal quantifier.

There are other factors that may render the *mei* without *dou* perfectly acceptable. One of such factors is complex NP. For example:

- (20) Wo xihuan ta xie de mei-ben shu.
I like he write DE every-CL book
I like every book he wrote.

In (20), *mei* is in the head noun that is modified by a clause. It seems that if the object is complex, movement is less desired, although it is still possible. For example:

- (21) Ta xie de mei-ben shu wo dou xihuan.
He write DE every-CL book I all like
I like every book he wrote.

Example (21) expresses the same meaning as (20), and the only difference is that the *mei*-phrase is moved to the left of *dou*.

Another construction where *mei* can occur alone is the indirect object in a ditransitive construction. For example:

- (22) Zhangsan gei-le mei-ge xuesheng yi-ben shu.
Zhangsan gave-Perf every-CL student one-CL book
Zhangsan gave every student one book.

In (22) it is not easy to move the indirect object to the front of the sentence, and thus it is preferable that it stay in situ.

In all of the above cases, it is possible to move the *mei*-phrase to the front of the sentence and make it bound by *dou*. However, due to certain factors, such as stress, complexity, movability, these *mei*-phrases can stay in situ. If these *mei*-phrases are just like a definite NP, it is not clear where their universal quantification force comes from, unless we assume that at least in these cases it is the *mei* that functions as the universal quantifier. Certainly, it is also possible to posit a phonologically null form of *dou* somewhere in these sentences, but such a hypothesis is not motivated by the linguistic data we consider here.

Second, although Lin (1998a) proposes that a *mei*-phrase denotes a set of individuals, he has to resort to strong quantificational features to explain the movement of *mei*-phrase in Mandarin. He claims that “universal NPs such as *meige ren* ‘every person’ and NPs like *dabufen-de ren* ‘most people’ have strong quantificational (and/or distributive) features which need to be checked (against *dou*) before spell-out.” It seems that he is not quite sure about the semantic contribution of *mei*, because he stipulates that *mei* has a strong quantificational feature, but as to the distributive feature, he is not so sure. Moreover, definite NPs do not have to move if they are not associated with *dou*. It can be assumed that these definite NPs do not possess the so-called strong quantificational features. But according to the semantics of *mei* given in (17), *mei*+NP is actually the same as a definite NP. Why does *mei* carry a strong quantificational feature if they are the same as a definite NP, which does not carry any strong quantificational feature. There is furthermore another problem. In his formulation of (17), there is no domain restriction on the predicate P, and thus it is similar to indefinites in this sense. But apparently *mei* has a stronger domain restriction than what is stated in (17), and that is why he assumes that *mei*+NP is a

definite NP. Therefore it seems that there is a discrepancy between his semantics and what he assumes, or at least there should be some further clarifications.

Second, if *meigeren* simply denotes a set of individuals, then how is it different from indefinites, the *wh...dou* construction, and definites? For example:

- (23) Dajia dou xihuan chi pingguo
People all like eat apple
People all like to eat apples.
- (24) Zhexie-ren dou xihuan chi pingguo.
These-people all like eat apple
These people all like to eat apples
- (25) Shei dou xihuan chi pingguo.
Who all like eat apple
Everyone likes to eat apples.

In example (23), *dajia* is an indefinite NP, because there is not a specific group of people that are referred to. In (24), *zhexie-ren* refers to a contextually salient group of people, and hence it is similar to a definite NP. In (25), *shei* can refer to anyone in the world with minimum domain restriction. If *mei*+NP just denotes a set of individuals, how is it different from these examples in (23)-(25). How is the domain restriction incorporated into the semantic interpretations of these different types of sentences?

Despite the three problems with Lin's (1998a) proposal I have pointed out above, I still think Lin (1998a) is essentially correct, and only minor modifications are needed. *Meigeren* in Mandarin by itself is not a full-fledged generalized quantifier. It is rather, figuratively speaking, a semi-quantifier, in the sense that it is neither a real quantifier nor a real NP that lacks any quantificational force. In terms of the co-

occurrence of *mei* and *dou*, there are certain parallels between the concord (negative concord and existential concord) examples discussed by Kratzer (2006) and the *mei...dou* construction. For example in the negative concord examples, the basic configuration is:

$$(26) \quad [[\text{Neg}] [\dots \text{negation} \dots \text{negation} \dots \text{negation} \dots]]$$

To interpret every negation in the configuration would be problematic, and therefore they should be treated as agreement features. Similarly, the basic configuration of *mei...dou* construction in Mandarin is:

$$(27) \quad [\dots \forall \dots \forall \dots]$$

If both universal quantifiers are related to the same NP, then there is a problem here too. Therefore I propose that the *mei...dou* construction is actually an instance of universal concord. Not all the universal quantifiers are semantically interpreted. Only one of those can be interpreted, and all others only carry an uninterpretable universal feature.

Then the next issue is whether *mei* carries the uninterpretable universal quantification feature, or *dou* carries that feature, or even maybe both carry this feature and they agree with a covert sentential operator, as suggested by Kratzer (2006) in her analysis of the negative concord in non-standard German. I will show here that *dou* is a propositional quantifier which is an instance of Kratzer's (2006) propositional \forall as formulated in (28):

$$(28) \quad \llbracket \forall \rrbracket^w(\mathcal{A}) = \{\lambda w'. \forall p[p \in \mathcal{A} \rightarrow p(w')]\}$$

First, *dou* can be used in sentences without *mei*, as indicated in examples (23), (24) and (25) above. When *dou* is used with a DP like *zhexie-ren*, or a wh-indefinite like *shei*, their quantificational force comes from *dou*. If we were to say that *dou* carried an uninterpretable universal feature, then we would have to posit an invisible sentential universal quantifier, so that *dou* can agree with this sentential quantifier and get its own quantification force. But such a system would be ruled out on the ground of economy. Before we have concrete evidence showing the existence of a covert sentential universal quantifier in Mandarin, we have to treat *dou* as having universal quantificational force.

Second, I want to show that *dou* could possibly be a propositional quantifier. Lin (1998a) among many others assumes that *dou* is the head of a Distributive Phrase, i.e. DistP. The position of DistP is below the subject, but above vP. Tsai (2001) argues that there are two types of verb raising languages. The first type is V-to-I languages, where the verb moves out of the vP to I. English might be such a language. On the other hand, Chinese is a V-to-v language, where the verb only moves to the light verb *v*, but does not move higher up to I. Thus *dou* can take the vP as a complement. Stepanov and Tsai (2008) mentions Chomsky's proposal that phases are propositional and are limited to CP and vP only. Therefore, vP can denote a proposition. If it generates a set of alternatives, then *dou* can operate on this set. In this sense, the Chinese *dou* is just a propositional quantifier. This is different from Shimoyama's (2001) original proposal. In Japanese, in most cases the *mo* is attached to a NP, and therefore *mo* takes a set of individuals and a predicate and universally quantify over all the individuals. In this sense the function of this *mo* is not very different from a traditional universal quantifier. But in Chinese, the *dou* is rarely directly attached to the *mei*-phrase. Rather it has scope over the whole vP, which is propositional.

Thirdly, I want to show that the *mei*-phrase has to be topicalized. The example in (1) does not show where *meigeren* is located. Is it in spec,IP or in C? If we look at those *mei*-phrases that generate at a much lower position than *dou*, it will be clear that in (1) *meigeren* is arguably moved from within IP to a higher position. For example:

- (29) Meigeren Yuehan dou xihuan
 Everyone John all like
 John likes everyone.
- (30) * Yuehan dou xihuan meigeren.
 John all like everyone
 John likes everyone.

In (29), the *meigeren* is in the object position. But it has to move to the front of the sentence. If it stays in situ, the whole sentence becomes unacceptable with the adverb *dou* present, as shown in (30). Thus it shows that sentence-initial *meigeren* is actually in the Left Periphery. The exact position of this *meigeren* can be seen from its interaction with *weishenme* (“why”). As argued convincingly by Stepanov and Tsai (2008), crosslinguistically the reason “why” is generated in C, while the purpose “why” is generated inside IP. In Mandarin, the reason *weishenme* is generated in C, while the purpose *wei-(le)-shenme* is generated inside IP. The reason reading is only available if *meigeren* is lower than it, as shown in (31), (32) and (33).

- (31) Weishenme meigeren dou xihuan chi pingguo?
 Why everyone all like eat apple
 Why does everyone like to eat apples?

- (32) ?Meigeren weishenme dou xihuan chi pingguo?
 Everyone why all like eat apple
 Intended reading: why does everyone like to eat apples?
- (33) Meigeren wei-le-shenme dou xihuan chi pingguo?
 Everyone for-PRF-what all like eat apple
 For what purpose does everyone like to eat apples?

In (31), *meigeren* is lower than *weishenme*. It has a reason reading. In (32) *meigeren* is higher than *weishenme*, and the sentence sounds odd. It can be improved by adding *-le* to make the purpose reading more obvious, as shown in (33). Therefore if *meigeren* is topicalized, it is located above IP, but still below the interrogative C. If we assume a more complex structure of the left periphery, there is a topic position below the interrogative C. This should be where *meigeren* is actually located.

The picture is more complicated if we add another possible configuration of *meigeren* on the tree. For example:

- (34) Yuehan meigeren dou xihuan
 John everyone all like
 John like everyone.

Here *meigeren* is lower than the subject. If the subject is within IP, it could be a problem. But we can use *weishenme* to test the position of *meigeren*. For example:

- (35) Yuehan weishenme meigeren dou xihuan?
 John why everyone all like
 Why does John like everyone?

In (35) the subject is higher than *weishenme* which is in the higher topic position, and therefore it shows that the subject actually is also topicalized. As argued by Rizzi (1997), there is possibly more than one topic position in the Left Periphery. If we assume that there are two positions for topics in the Left Periphery, one above the interrogative C and one below it, then what (29) and (34) show is that the subject *Yuehan* and the object *meigeren* can occupy the higher and the lower position respectively. Therefore, we can conclude that *meigeren* is in the topic position in the left periphery.

Now we have shown that *dou* takes a vP as its complement, and the vP is propositional. If there is an indefinite inside the vP, then it gives a set of alternatives. Then *dou* can quantify over these alternatives. I have also shown that the *mei*-phrase has to move to a topic position in surface syntax. Therefore it is time to give a parallel derivation of the sentence in (1), i.e. the semantic derivation and the syntactic derivation. First, let me give a simply illustration of how the compositional semantics proceeds according to the Alternative Semantics, as shown in (36)-(39).

$$(36) \quad [\text{dou } [_{\text{vP}} \text{ meigeren likes to eat apples}]]$$

$$(37) \quad \llbracket \text{meigeren} \rrbracket^{w,g} = \{x \in \text{De} : \text{person}(x)(w)\}$$

$$(38) \quad \llbracket \text{likes to eat apples} \rrbracket^{w,g} (\llbracket \text{meigeren} \rrbracket^{w,g}) \\ = \{ \lambda w'. \text{a likes to eat apples in } w'; \\ \lambda w'. \text{b likes to eat apples in } w'; \\ \lambda w'. \text{c likes to eat apples in } w'; \\ \dots \} \text{ (call this set } \mathcal{A})$$

$$(39) \quad \llbracket \text{dou} \rrbracket^w \mathcal{A} = \{ \lambda w'. \forall p [p \in \mathcal{A} \rightarrow p(w')] \}$$

On the syntactic side, I have shown that *mei* does have its universal quantificational force in some sense. Thus it is reasonable to assume that *mei*-phrase carries an uninterpretable universal feature, which agrees with the interpretable universal feature of *dou*. The uninterpretable feature on *mei* needs to be checked off by *dou* via a spec-head configuration. The following is an illustration of how this syntactic derivation proceeds.

(40) [dou_F [meigeren_{uF} likes to eat apples]]

(41) [meigeren_{uF} dou_F [t likes to eat apples]]

(42) [meigeren [t dou_F [t likes to eat apples]]

In (40), *meigeren* is inside vP, carrying an uninterpretable feature of universal quantification. In (41) it moves to a local configuration with *dou* which carries the interpretable feature. The uninterpretable feature on *meigeren* is checked off, and then it moves to the topic position. The whole derivation converges.

Now I have shown that my universal concord analysis preserves the intuition that *meigeren* is indeed somehow quantificational. Moreover, the movement of *mei*-phrases is triggered by the uninterpretable universal feature on *mei*. Although there have been previous proposals to account for the movement of *mei*, the trigger of the movement can only be stipulated. Only in my analysis of universal concord does the trigger of movement follow naturally from the architecture of universal concord. Thus my analysis overcomes the shortcomings of previous analyses, and also shows more evidence for the analysis of concord phenomena in the Alternative Semantics proposed by Kratzer (2006).

We have only looked at a simple case of universal concord. In Kratzer's (2006) examples on negative concord and existential concord, it is possible to have multiple

indefinites as shown previously in (7) and (8). Therefore we should try to find multiple concord in the Mandarin *mei...dou* construction. Indeed there are many such examples.

Firstly there are adverbs that are morphologically composed of two instances of *mei*. For example, *mei-me* (“every-every”) means “every time”, *mei-shi-me-ke* (“every-hour-every-quarter”) means “every minute”. They must be accompanied by *dou* as shown here:

(43) Wo mei-me kandao ta dou hen gaoxing.

I every-every see him all very happy

Every time I see him I am happy.

(44) Yuehan mei-shi-me-ke dou xiang-zhe yuyanxue wenti.

John every-hour-every-quarter all think-Prog³ linguistics problem

John thinks about linguistics problems every minute of the day.

Secondly, *dou* can be associated with two *mei*-phrases in one sentence, as long as they can be both moved to the front. For example:

(45) Meige laoshi dui meige xuesheng dou hen hao

Every.Cl teacher to every.Cl student all very good

Every teacher is good to every student.

In (45), *dou* is associated with *meige laoshi* and *meige xuesheng*. This is comparable to the multiple-existential concord example in (8).

But first we have to figure out what universal concord means? In Kratzer’s (2006) paper, she gives examples of existential concord. I have explained what

³ Zhe is a progressive aspect marker.

existential concord means when discussing example (8). The crucial point is that in the free choice reading of (8), the two existential quantifiers can not enter scope interaction with each other. We have to keep track of both sets of alternatives simultaneously. Then such a set is closed off by a covert existential quantifier. Therefore by analogy, what universal concord means is that there are multiple variables that give rise to a set of alternatives which are then universally quantified. Actually this is exactly what (45) means, or at least it is one of the available readings of (45).

Suppose there are three teachers a,b,c and two students x, y. Then in the same way as in the existential concord case, we get a set of alternatives with a variable from each set, as shown in (46):

$$(46) \quad \langle a,x \rangle \quad \langle a,y \rangle \quad \langle b,x \rangle \quad \langle b,y \rangle \quad \langle c,x \rangle \quad \langle c,y \rangle$$

In terms of propositional alternatives, we get the set in (47). Then by applying *dou* to the set in (47) we get the desired reading.

$$(47) \quad \{a \text{ is good to } x ; a \text{ is good to } y ; b \text{ is good to } x ; b \text{ is good to } y ; c \text{ is good to } x ; c \text{ is good to } y \}$$

$$(48) \quad \text{Dou}+(47) \rightarrow \text{all the propositions in (47) are true.}$$

Thus I have shown that (47) can indeed be analyzed as a case of universal concord. But different from existential quantifiers, the scope of universal quantifiers with respect to each other does not seem to give rise to very different readings. For example:

- (49) Every teacher likes every student.
- a. For all teachers x , for all students y , x likes y .
 - b. For all students y , for all students x , x likes y .

In (49), the two universal quantifiers can take either wide or narrow scope with respect to each other. But the two readings in (49) and (49) are the same. Thus we might need to think of a way to tease apart these two readings from the true universal concord cases. I will use the adverb *chabuduo*, which means “almost”, to test if there are indeed differences between these different readings.

Let’s take (45) as a starting point. Since *chabuduo* (“almost”) can be used to modify a universal quantifier, and *mei* and *dou* in Mandarin both have universal quantificational force, it is therefore possible to attach *chabuduo* to the two *mei*-phrases or to the *dou* in (45), as shown in (50)-(52).

- (50) Chabuduo meige laoshi dui meige xuesheng dou hen hao.
 Almost every.Cl teacher to every.Cl student all very good
 Almost every teacher is good to every student.
- (51) Meige laoshi dui chabuduo meige xuesheng dou hen hao.
 Every.Cl teacher to almost every.Cl student all very good
 Every teacher is good to almost every student.
- (52) Meige laoshi dui meige xuesheng chabuduo dou hen hao.
 Every.Cl teacher to every.Cl student almost all very good
 It is almost the case that every teacher is good to every student.

In (50), *chabuduo* is attached to the first *mei*-phrase; in (51) it is attached to the second *mei*-phrase, and in (52) it is attached to *dou*. What we want to show is that there

should be cases where (50) and (51) have similar readings, while (52) has a different reading. Suppose there are five teachers a, b, c, d, e and five students A, B, C, D, E. Suppose also that “almost” means, conveniently for our current purpose, that only one individual in the set denoted by “every” does not satisfy the condition.

In case (50), suppose that teacher e does not satisfy this condition. Therefore there are 20 pairs:

$$(53) \quad \begin{aligned} &<a, A> <a, B> <a, C> <a, D> <a, E> <b, A> <b, B> <b, C> <b, D> \\ &<b, E> <c, A> <c, B> <c, C> <c, D> <c, E> <d, A> <d, B> <d, C> \\ &<d, D> <d, E> \end{aligned}$$

In case (51), suppose that student E does not satisfy this condition, there are again 20 pairs:

$$(54) \quad \begin{aligned} &<a, A> <a, B> <a, C> <a, D> <b, A> <b, B> <b, C> <b, D> <c, A> \\ &<c, B> <c, C> <c, D> <d, A> <d, B> <d, C> <d, D> <e, A> <e, B> \\ &<e, C> <e, D> \end{aligned}$$

If all teachers and all students are considered, then we get 25 pair:

$$(55) \quad \begin{aligned} &<a, A> <a, B> <a, C> <a, D> <a, E> <b, A> <b, B> <b, C> <b, D> \\ &<b, E> <c, A> <c, B> <c, C> <c, D> <c, E> <d, A> <d, B> <d, C> \\ &<d, D> <d, E> <e, A> <e, B> <e, C> <e, D> <e, E> \end{aligned}$$

For case (52), suppose we take one member out from each set, say e and E, then we get 16 pairs:

$$(56) \quad \begin{aligned} &<a, A> <a, B> <a, C> <a, D> <b, A> <b, B> <b, C> <b, D> \\ &<c, A> <c, B> <c, C> <c, D> <d, A> <d, B> <d, C> <d, D> \end{aligned}$$

If we treat the two quantifiers as separate alternatives, then we would apply *chabuduo* separately to each set of alternatives, and then compose the paired-up set. This is the result shown in (56), which should be the reading of (52). But this cannot be the right interpretation because 16 out 25 isn't "almost". Thus the only possible way of deriving the correct reading for (52) is to look at the paired-up set (55) and apply *chabuduo* to this set to yield 24 pairs, according to our simple definition of "almost".

Therefore this whole proof shows that there are indeed cases, e.g. (52), where we have to look at the two quantifiers simultaneously, which leads to a different reading than if we look at them separately. Again if we look at them separately, they always have the same type of readings, as predicted by (49) and (49). Now recall the case of existential concord, and we have successfully demonstrated a parallel example of universal concord!

Regarding the computation of multiple variables into one alternative set, there are two possibilities. The first one is that the function takes pairs of variables as arguments. For example:

(57) The set of pairs of variables in (45) can be:

$$\{<a,x>, <a,y>, <b,x>, <b,y>, <c,x>, <c,y>\}$$

(58) The set of function can be :

$$\{\lambda <x,y>. x \text{ is good to } y\}$$

This way of deriving the alternative set in a one-step fashion is easy, but at this point it might not be quite clear what syntactic object these pairs correspond to.

There might be another way of computing the alternatives, i.e. cyclic Image Construction Functional Application. For example:

- (59) the set of function to start with: $\{\lambda y. \lambda x. x \text{ is good to } y\}$
- (60) the set of alternatives in the object position: $\{x, y\}$
- (61) first application: a set of functions, not a singleton set anymore
 $\{\lambda x'. x' \text{ is good to } x; \lambda x'. x' \text{ is good to } y;\}$
- (62) the set of alternatives in the subject position: $\{a, b, c\}$
- (63) second application:
 $\{a \text{ is good to } x; b \text{ is good to } x; c \text{ is good to } x;$
 $a \text{ is good to } y; b \text{ is good to } y; c \text{ is good to } y;\}$
- (64) $\text{dou}+(63) \rightarrow \text{each proposition is true.}$

We can see this cyclic application corresponds to the syntactic tree nicely. This might suggest that this second type of derivation is more desirable. But later in this paper when I discuss the differences between multiple *wh...dou* constructions and multiple *mei...dou* constructions, I will show that actually the first type of derivation involving pairs of variable is actually the correct method. But for now, let's just leave this question open.

I have mentioned three problems with the *mei...dou* construction earlier in this paper. Now we have solved two of them, namely the co-occurrence requirement and the Leftness Condition. Co-occurrence is a case of universal concord, and Leftness Condition is a result of feature checking. Then what about the Clause-mate Condition illustrated in (11)-(14) which are repeated here as (65)-(68).

- (65) Meigeren dou qu kan dianying zuihao.
 Everyone all go see movie best
 It will be good that everyone goes to see the movie.
- (66) *Meigeren qu kan dianying dou zuihao.
 Everyone go see movie all best
 Intended reading: same as (65).
- (67) Meigeren dou renwei Yuehan xihuan chi pingguo.
 Everyone all think John like eat apple
 Everyone thinks that John likes to eat apples.
- (68) *Meigeren renwei Yuehan dou xihuan chi pingguo.
 Everyone think John all like eat apple
 Intended reading: same as (67).

What (65)-(68) show is that bi-clausal association of *mei* and *dou* is not allowed. This follows naturally from the checking mechanism. For example in (68), the matrix subject *meigeren* is never in the scope of *dou*, and hence the uninterpretable universal feature of *mei* can not be checked off. In (66), the subject clause can be argued to involve two different clauses. For example, (65) is actually a little bit unnatural, and it can be improved by making the bi-clausal structure more obvious, as shown in (69).

- (69) Meigeren dou qu kan dianying, zheyang zuihao.
 Everyone all go see movie this way best
 Everyone goes to see the movie. This way it is best.

If all sentences with a subject clause in Mandarin can be argued to involve bi-clausal relations, then the *meigeren* in the subject clause is never in the scope of the *dou* above the main predicate. Thus it leads to the same unchecked feature, as in (68).

Therefore I have accounted for the three problems with the analysis of the *mei...dou* construction in Mandarin, which have been a long-standing issue. By resorting to the universal concord phenomenon, I have shown that all these three problems can be solved very naturally. Before finishing up this section, I want to add one more piece of evidence for the uninterpretable universal feature carried by *mei*.

Mei is actually only one of many universal quantifiers in Mandarin. There are at least two other similar ones, i.e. *suoyou* and *quantu*. Literally, *suoyou* means ‘all there is’ and *quantu* means ‘the whole body of’. These two universal quantifiers do not have to co-occur with *dou*, although they are indeed compatible with *dou*. For example:

- (70) Suoyou-de xuesheng kai le yi-ge hui.
 All student open Perf one-CL meeting
 All students attended a meeting.
- (71) Suoyou-de xuesheng dou kai le yi-ge hui
 All student all open Perf one-CL meeting
 Every student attended a (possibly different) meeting.
- (72) Quanti xuesheng kai le yi-ge hui.
 All student open Perf one-CL meeting
 All students attended a meeting.
- (73) ??Quanti xuesheng dou kai le yi-ge hui
 All student all open Perf one-CL meeting
 All students attended a (possibly different) meeting.

In (70), *suoyou* is used alone without *dou*, and the preferable reading is a collective one, in which all students attended the same meeting, although it is also compatible with a scenario where the students attended different meetings. In (71), *suoyou* is associated with *dou*, and the only reading is a distributive one. In (72), *quanti* is used alone, and the only reading is a collective one, and it is not possible to interpret (72) as distributive. In (73), the use of *dou* forces a distributive reading, and although it is not totally out, it is still very odd, hence the two question marks.

What these examples show is that *suoyou* and *quanti* do not carry any uninterpretable universal feature, since they do not have to co-occur with *dou*. The only universal quantifier that carries the uninterpretable feature is *mei*, and morphologically *mei* is the form of agreement. It also seems that *mei* is strongly distributive, and *quanti* is strongly collective, as shown in (73), while *suoyou* is inherently ambiguous.

4.4 The *Wh-Dou* Construction in Mandarin

Shimoyama (2001, 2006) talks about the *wh...mo* universal construction in Japanese. The interpretation of this construction is the same as other *wh...operator* sequences in Japanese. The Mandarin *wh...dou* construction is very similar to the Japanese universal construction. But despite the semantic similarity, the Mandarin *wh...dou* differs from the Japanese *wh...mo* syntactically. The generalization about *wh...dou* is that the *wh*-indefinites have to move to the left side of the *dou*, which is a similar condition to the “the Leftness Condition” for the *mei...dou* construction. There have been explanations as to why there should be this Leftness Condition. I will propose a new account which is along similar lines to the motivation of the leftward movement of *mei*-phrases, in terms of feature checking.

I have claimed in Chapter 2 that all *wh*-indefinites carry a default focus feature in Mandarin. This focus feature expands as the alternative set expands upward. If no binder is met, then the whole derivation yields a set of propositions, which is the denotation of a question. The focus feature is unchecked since it corresponds to the focus semantic value and focus intonation in *wh*-questions in Mandarin. In Chapter 3, I argued that the focus feature has to be checked off by either the modal licenser non-locally or by the existential quantifier locally. This process shows two things. First, if the alternative set is closed and a single proposition is yielded, then the focus feature needs to be checked off. Second, the checking mechanism can be either local or non-local. If the checking is local, then a quantifier that closes off the alternative set can check off this focus feature. On the other hand if the checking is non-local, then we need a different checker other than the quantifiers, e.g. the modal operators in the existential readings, as shown in Chapter 3.

Now let's consider the *wh...dou* construction. Apparently, the alternative set is closed by a universal quantifier. Set closure requires checking of the focus feature. Therefore the focus feature on these *wh*-indefinites in *wh...dou* should be checked off either locally or non-locally. The movement of these *wh*-indefinites indicates that the checking mechanism here is local. To be more specific, the *wh*-indefinite moves to the spec position of the *dou*, and now they are in a local relation, although before the movement they are not in a local relation. As I have mentioned above, local checking of the focus features can be done by quantifiers, and then naturally the adverb *dou* meets this condition and it checks off the focus feature. On the other hand, the reason why the non-local checking mechanism is not used here is that, unlike in the existential readings where they have a modal licenser, there is no potential non-local checker in this case. Now please recall the feature checking mechanism in the *mei...dou* construction. Here again, we see the same mechanism. In both cases, the

feature checking mechanism is well-motivated, instead of being stipulated as in previous accounts. In the *mei...dou* construction, the feature checking follows from the concord phenomenon, and in the *wh...dou* construction, the feature checking follows from the general requirement of the theory.

Derivationally, most of the semantic and syntactic process is the same as in the universal concord cases. The *wh*-phrases move to a higher position than IP, and *dou* is still a propositional quantifier. *Wh*-phrases denote sets of individuals, and then by Image Construction Functional Application, we get a set of propositions, and then “all” quantifies over all these propositions while at the same time attracting the *wh*-indefinites into a local configuration.

Nothing seems to be new here. However if we look at multiple *wh*-indefinites, it seems that there is no parallel between *wh...dou* and universal concord. For example:

- (74) Shei ba shenme-dongxi dou reng-le?
 Who BA what-thing all throw-PRF
 a. Who threw everything away?
 b. *Everyone threw everything away.
 c. *What did everyone throw away?

In (74), the only reading possible is one that the lower *wh*-phrase gets a universal reading and the higher *wh*-phrase gets a question reading. It is not possible to get a universal reading for both *wh*-phrases, as indicated in (74)-b, and also it is no possible to get a universal reading for the higher *wh*-phrase but a question reading for the lower *wh*-phrase, as shown in (74)-c. This seems quite unexpected, since the whole derivation is essentially the same as in the universal concord cases.

There are two possible solutions. One is that once a wh-phrase moves into a local relation with *dou* it stays there and does not move on. Therefore the position is occupied, and no more wh-phrase can move in to receive a universal reading. Therefore the higher wh-phrase is actually a topicalized question. Thus we have the following derivation:

(75) [dou [_{VP} shei ba shenme-dongxi reng-le]]

(76) [ba shenme-dongxi dou [shei t reng-le]]

(77) [shei₂ [ba shenme-dongxi₁ dou [t₂ t₁ reng-le]]]

In (75), both wh-phrases are inside the vP. In (76), one of the wh-phrases moves to the spec of *dou*, and stays there. In (77), the other wh-phrase is topicalized, but it is still interpreted as a question, since the focus feature has not been checked off and it is not bound by any set-reducing operator⁴. On the other hand, in the universal concord cases, the *mei* phrases move into a local relation and then move on. The trace can be erased for other *mei*-phrases to move in.

This account is however wrong. For one thing, the staying of wh-pronouns and the erasure of traces of *mei* are just stipulations. They are not independently motivated. Moreover, and more importantly, in the *wh...dou* construction, the closest wh-phrase does not have to be adjacent to the *dou*. For example:

(78) Shei ba shenme-dongxi zai kai-wan wanhui yihou dou reng-le?

Who BA what-thing at open-finish party after all throw-PRF

Who threw everything away after the party was over?

⁴ I have argued in Chapter 2 that there is no question operator or particle in Mandarin. In that case, the wh-pronouns are not bound by any operator at all.

In (78), a time clause intervenes between the closest wh-phrase and *dou*. If the wh-phrase indeed does not move on after checking the focus feature against *dou*, how can it be possible for the time clause to intervene? Therefore this obvious explanation is not viable at all.

There is another possibility of accounting for this contrast between multiple *mei...dou* and multiple *wh...dou*. What is the crucial difference between *mei* and wh-pronouns in Mandarin? As I have shown, *mei* carries an uninterpretable universal feature, while wh-pronouns carry an interpretable focus feature. This feature is interpretable because in a wh-question in Mandarin, no obligatory movement or obligatory question operator is needed to bind a wh-pronoun at all. There is no evidence that in wh-questions the focus feature has to be checked. On the other hand, in the focus semantics (Rooth 1992), the focus feature is interpreted at LF as giving rise to a set of alternatives. Therefore the focus feature is not a uninterpretable phonological feature. Thus my explanation makes use of this crucial difference between the features carried by *mei* and *wh*.

First let's assume that feature checking is done derivationally, as argued by Tsai (1999) about the Mapping Hypothesis (Diesing 1992). After each phase, necessary feature checking should take place at once. This means that if there is multiple feature checking, they should be done at the same time.

Second let's assume that this multiple feature checking is done by across-the-board extraction. For example, in the multiple *mei...dou* construction, all *mei* phrases are extracted at the same time and form one syntactic object and then moves to the spec of *dou* to check the uninterpretable feature. By forming one syntactic object, the multiple uninterpretable features are automatically collapsed into one. This can be shown as follows:

$$(79) \quad [\text{dou}_F [\text{mei}_{1[uF]} \dots \text{mei}_{2[uF]} \dots]]$$

$$(80) \quad [[\text{mei}_1 + \text{mei}_2]_{[uF]} \text{dou}_F [t_1 \dots t_2 \dots]]$$

On the other hand, if multiple *wh*-phrases are checked in the *wh...dou* construction, the interpretable focus feature prevents the multiple *wh*-phrase to form one syntactic object, as shown in (81). Therefore it is not possible to check more than one *wh*-phrase in the *wh...dou* construction.

$$(81) \quad \text{wh}_{1[+focus]} + \text{wh}_{2[+focus]} \neq [\text{wh}_1 + \text{wh}_2]_{[+focus]}^5$$

If the contrast between (80) and (81) is correct, it can account for the difference between these two constructions in a straightforward way.

Now let's take a look at (80) again. Recall that in (57) and (58), I discuss one possibility of computing multiple *mei* phrases into an alternative set. I argue that it is possible to have an *n*-tuple of variables. Now what (80) means is just that. The movement in (80) does two things. First it restructures the alternative set into a set of alternatives that contains pairs of variables in their formulation. Second, movement checks features. In light of this simultaneous checking mechanism, the approach in (57) and (58) is probably better than the cyclic Image Construction Functional Application approach.

4.5 Differences Between the Two Universal Constructions

In this section, I want to talk about some semantic differences between these two constructions, and I argue that such differences might arise from the fact that in

⁵ In Chapter 2 and Chapter 3 I used the letter "F" to refer to the focus feature. But here I'll use [+focus] just to distinguish it from the quantificational features carried by *mei*-phrases. It is just a notational difference here.

the universal concord cases, the *mei* phrases are actually more like a real quantifier due to the uninterpretable universal feature.

Even though these two constructions have similar universal meanings, their domain of quantification is still different. The *mei...dou* construction seems to have a narrower domain of individuals to quantify over, while the *wh-dou* construction has a wider domain. For example:

(82) Meigeren dou xihuan Yuehan

Everyone all like John

Everyone likes John.

(83) Shei dou xihuan Yuehan

Who all like John

Everyone likes John. (Whoever it is, he likes John)

The *meigeren* in (82) has a preferred reading that everyone around John or that socializes with him likes him. But the *shei-dou* in (83) is less restricted, it could mean that everyone in the world likes John. This reminds me of an example discussed by Kratzer (2006). She observes that the *irgend-* part of *irgendein* induces domain widening, as Kadmon and Landman have suggested for English *any*. For example:

(84) Mary musste **irgendeinen** Arzt heiraten.

Mary must irgend-one doctor marry.

Mary had to marry a doctor or other. (narrow scope reading)

(85) Mary musste **einen** Arzt heiraten.

Mary must a doctor marry.

Mary had to marry a doctor.

In (85), it is true in a scenario where Mary was only given two marriage options, while (84) can not be used in the same scenario, and the domain for (84) is much wider, possibly including all doctors in the world. Thus it seems that a genuine quantifier have contextually determined domain restrictions, while an indefinite does not. This is exactly where the distinction between (82) and (83) lies. In (82) the *meigeren* carries an uninterpretable universal feature. It therefore behaves more like a real quantifier. Universal quantifiers like “every” usually have a contextually salient domain of quantification. For example:

(86) Good, everyone is here. Let’s start.

In (86), “everyone” only applies to those that are relevant or expected. It does not mean everyone in the world. Similarly, in Mandarin, in the situation of (86) only the *mei...dou* construction is appropriate, while the *wh...dou* construction seems very odd.

(87) Hao, meigeren dou lai-le. Women kaishi ba.
 Good, everyone all come-PRF. We start PAR
 Good everyone is here. Let’s start.

(88) *Hao, shei dou lai-le. Women kaishi ba.
 Good, who all come-PRF. We start PAR
 Good, whoever it is, he is here. Let’s start.

Because the *wh*-indefinites genuinely lack quantificational force, not even an uninterpretable feature of quantification, they are more like the German *irgend-*indefinites, in that they have wider domains.

4.6 Summaries

In this chapter, I argued for an analysis of two types of universal quantification in Mandarin. The controversial *mei...dou* construction is considered to be a case of universal concord in the Alternative Semantics theory. This explains away the conflict in previous analyses where both *mei* and *dou* are treated as some sort of quantifier. I argue that syntactically *mei* carries an uninterpretable universal quantificational force, and hence giving rise to a narrower domain. On the other hand, the *wh-dou* construction simply provides a set of propositions for quantification, and the domain of quantification is much wider. Moreover, there is multiple universal concord in the *mei...dou* construction, while there is no such multiple concord in the *wh-dou* construction. I explain this by arguing that multiple feature checking requires that the multiple *mei*-phrases or *wh*-phrases form one syntactic object at the spec of *dou*. The uninterpretable feature on *mei* can be collapsed into one, but the interpretable focus feature prevents multiple *wh*-phrases to form one syntactic object.

So far I have discussed issues with argument *wh*-indefinites in the framework of the Alternative Semantics theory (Rooth 1985, Kratzer 2006), and it has been shown that this new theory has both theoretical and empirical advantages in explaining the *wh*-questions in Mandarin. In terms of the existential readings and the universal readings of *wh*-indefinites in Mandarin, this general theory of indefinites can also give us a more straightforward and well-motivated explanation.

This chapter concludes the first part of this dissertation which is on the argument *wh*-indefinites. The next three chapters form the second part of this dissertation, which deals with non-argument type *wh*-questions, i.e. “how” and “why” questions.

CHAPTER 5

THE SEMANTICS OF MANNER HOW QUESTIONS

The study of the semantics of wh-questions has always been focused on the argument-type wh-questions, such as *what*, *who*, and *which*, while the adjunct-type wh-questions, such as *how*, *why*, *when* and *where*¹, are generally ignored, although not in the syntactic research in questions. On the one hand, in terms of the denotation of questions, both the proposition-set theory of Hamblin (1958, 1973) and the partition semantics of Groenendijk and Stokhof (1984) are based primarily upon argument-type wh-questions. These two theories are intended to be a general theory of the denotation of questions. Therefore they should be equally applicable to adjunct-type wh-questions as well. Although this is a valid assumption, there is still a big gap between a general theory and a spelled-out semantics of questions about wh-adjuncts. It is obvious that wh-arguments are variables ranging over individual entities of type *e*, and wh-adjuncts range over higher-order entities. But the question is what these higher-order entities are, and what the semantic representation of such questions is. There has not been any satisfactory answer to these questions. On the other hand, studies in the compositional semantics of questions also emphasize argument-type wh-questions, as I have shown in chapters 2, 3, and 4. In all of the three types of compositional semantics for

¹ Most “where” questions are adjunct-type wh-questions. But sometimes, they are semantically more like arguments. For example:

Q: Where did you go?
A: I went to the bookstore.

In such questions, the place should be regarded as the object of the verb. Although the verb “go” is intransitive in English, it can be transitive in other languages such as Mandarin. For example:

Wo qu-le shudian.
I go-PRF bookstore
I went to the bookstore.

questions, only argument-type wh-questions are studied, while adjunct-type wh-questions are either totally ignored or consigned to footnotes. Thus it seems that more research needs to be done in the area of the denotation and compositional semantics of adjunct-type wh-questions. In the next three chapters, I will make an effort towards this direction in exploring the denotation and compositional semantics of adjunct-type wh-questions, with a focus on “how” and “why” questions.

Now this chapter studies the denotation of manner questions with the wh-adjunct “how”, and proposes an event-based semantic representation of such questions. The goal of this project is to spell out the semantics of manner “how” questions in detail, and see what problems can be solved by referring to the different semantic properties of these questions. It is shown that the true answer set of an adjunct manner “how” question contains only one true proposition, due to a non-cancelable presupposition. Such a semantic approach to manner questions accounts for a wide range of data including the following. First it explains the asymmetry of “all” quantification over answers in languages like English, German, Dutch and Mandarin. Second it responds to the problem with regard to the choice function on wh-adjuncts pointed out by Reinhart (1998), and also sheds light on Szabolcsi and Zwarts’s (1993) claim that manners are join semi-lattice structures. Third, it also explains the unavailability of quantificational variability in embedded wh-adjunct questions.

The chapter is organized as follows. Section 5.1 describes a classification of “how” questions, and limits the discussion in this chapter to only one of these types. i.e. the manner “how” question. Section 5.2 explores the semantic characterization of manner “how” questions along the lines of Karttunen (1977). Section 5.3 deals with the asymmetric distribution of the exhaustivity marker “all” in questions. Explanation of data from English, German, Dutch and Mandarin will be shown to derive from the semantic representation proposed in section 5.2 in a very straightforward way. Section

5.4 takes up the unsolved issue of choice functions in Reinhart's (1998) paper, and shows that there is indeed no proper entities for the choice function to be applied to. Szabolcsi and Zwarts's (1993) claim that manners form a free join semilattice will also be discussed in light of my proposal of the denotation of manner questions. Section 5.5 discusses the unavailability of quantificational variability in adjunct-type wh-questions, as pointed out by Lahiri (2002). I will show that such phenomena can be accounted for along the same lines as the asymmetric distribution of the exhaustivity marker "all" in wh-questions. Section 5.6 summarizes the major points in this paper and makes suggestions for further studies.

5.1 Three Types of "How" Questions

Apparently, the biggest challenge in dealing with adjunct-type wh-questions their seeming complicated uses. Unlike argument-type wh-questions, the forms of the answers to adjunct-type wh-questions are less constrained by the forms of the question. Take "how" questions for example. There are at least three very different types of "how" questions, according to Jaworski (2009). The first type is called analytic "how" questions, which include "how" questions of means, of method, and of mechanism. Consider the following question and answer pair.

- (1) Q: How do I get a New Jersey driver's license? Jaworski (2009: 134)
A: With great patience.

The answer is clearly infelicitous. What we expect is a means of getting the driver's license. It could be something like "First, go to the DMV, and then fill out a form, ...". This example shows that different "how" questions need to be answered differently

and that there is no formal correspondence between the question and the answer. An analytic “how” question of method can be:

(2) Q: How do you dance a swing?

Jaworski (2009: 134)

A: Backstep, one-two-three, one-two-three.

The answer with an accompanying demonstration constitutes the method of dancing a swing. An analytic “how” question of mechanism is harder to construct. Jaworski (2009) gives the following scenario. “Suppose a student in a neuroscience class complained as follows: ‘Look, all we’re talking about is how individual neurons perform simple little tasks. What I want to know is how humans manage to perform big complicated tasks. For instance, how do you dance a swing?’” (Jaworski 2009: 134). Although the question is the same as in (2), it cannot be answered with the same sentence. A more appropriate answer should be “The primary motor cortex has a group of cells which generate actions potentials; and these generate action potentials in the adjacent cells, and those in turn...” The answer is an explanation of the mechanisms at work in dancing a swing.

The second type is called “how” questions of “cognitive resolution”. These are questions which request information to relieve some type of cognitive tension. For example:

(3) How can we be free and yet live in a deterministic universe

This question is raised against a background of mutually inconsistent claims, and the answer should aim to resolve this inconsistency. For example, the above question assumes that something is free only if its behavior is not governed by deterministic

principles. Then the answer “Freedom requires only that we do what we want and determinism doesn’t rule that out” Jaworski (2009: 135)

The third type of “how” questions are manner questions. For example:

(4) Q: How did they dance at the party last night?

A: They danced carefully in circles.

Both the manner adverb “carefully” and the phrase “in circles” describe how the dancing was performed.

The above classification shows the kind of complexity in the use of “how” questions, and linguistically speaking the analytic “how” questions and the “cognitive resolution” questions are not as interesting as the manner questions in terms of question-answer congruence. In other words, the biggest difference between manner questions and the other two types of “how” questions is that there is a nice formal correspondence between the question and the answer, i.e. the form of the question is similar to the form of the answer. Thus I will focus my attention on manner “how” questions only in this chapter, and leave the denotation of the other two types of “how” question for future research. Ideally, the semantics of manner “how” questions should be applicable to the other two types with some modifications.

5.2 The Semantics of Manner Questions

In this section, I will discuss the semantics of manner questions using the proposition set semantics of Hamblin and Karttunen. But before that I will introduce the event semantics, which was first proposed by Davidson (1967) and further developed by Parsons (1990).

Davidson (1967) argued for an ontology which includes events, in addition to the usual entities of concrete material objects and etc. It has since been shown that a number of linguistic phenomena such as nominalization, adverbial modification, tense and aspect, causal statements, and temporal reasoning, can be successfully accounted for within an event-based semantics. Take the sentence in (5) as an example:

(5) Brutus stabbed Caesar violently.

The sentence is about an event of stabbing. The agent of the event is Brutus, and the patient of the event is Caesar. The event is a violent one. Thus the logical form of (5) can be represented as (6) in the neo-Davidsonian event semantics of Parsons (1990):

(6) $\exists e [\text{Stabbing}(e) \wedge \text{Agent}(e, \text{Brutus}) \wedge \text{Patient}(e, \text{Caesar}) \wedge \text{Violent}(e)]$

Such an event semantics applies only to action sentences. There are, however, stative sentences in natural language too. Some scholars therefore argue that states should be treated on a par with events. For example:

(7) Caesar loved Brutus wholeheartedly

The sentence is about a state of loving. The subject of the loving is Caesar and the object of the loving is Brutus. The loving state is wholehearted. Again this can be represented in an event-based semantics as:

(8) $\exists s [\text{Loving}(s) \wedge \text{Subject}(s, \text{Caesar}) \wedge \text{Object}(s, \text{Brutus}) \wedge \text{Wholehearted}(s)]$

The variable *s* ranges over states. The representation of stative sentences is essentially the same as action sentences, where adverbs are treated as a property of the event argument.

Now I will extend the event semantics to the answers to manner questions. Consider the question in (9), adapted from Davidson's (1967) original example.

(9) How did Jones butter the toast?

(10) a. He buttered the toast slowly.

b. He buttered the toast slowly with a knife in the kitchen.

c. *He buttered the toast slowly, he buttered the toast with a knife, and he buttered the toast in the kitchen.

The sentence in (10)-a is a perfect answer to (9); (10)-b is also an acceptable answer. But (10)-c is not a felicitous answer, because it is not clear whether the three conjuncts are about the same event of "toast buttering". They could be three separate events.

Then what is the denotation of (9)? In the Hamblin-style proposition set approach of questions, the denotation of a question is the set of propositions as possible answers to that same question. Since (10)-a is a good answer, other "model" answers should be similar and we can posit a set of possible answers as shown in (11):

(11) {that Jones buttered the toast slowly,
that Jones buttered the toast quickly,
that Jones buttered the toast absentmindedly,
that Jones buttered the toast happily,
.....}

From this set of possible answers, we can see that “how” ranges over adverbs like “slowly” and “happily”, which are properties of events in the event semantics. Thus by combining the Hamblin semantics of questions with the event semantics, we can give the following representation of the denotation of the manner “how” question in (9)²:

$$(12) \quad \{p \mid \exists P [p = \wedge \exists e. [\text{Buttering}(e) \wedge \text{Agent}(e, \text{Jones}) \\ \wedge \text{Patient}(e, \text{toast}) \wedge P(e)]]]\}$$

In (12), the variable P ranges over properties of events, as in the event semantics. Compared to an argument-type wh-question, the only difference between them is the domain of quantification of the existential quantifier. In wh-questions, it always quantifies over an individual of type e , while in “how” questions the quantification is over a property of type $\langle s, t \rangle$ ³. These are more complex entities than the individual entities, which might be the reason why such adjunct-type wh-questions are harder to deal with and their answers show a greater degree of variation.

The formula in (12) gives the Hamblin semantics of “how” questions. As Karttunen (1977) has shown, in certain contexts, the denotation of a question is the set of true answers to the question. For example, if a question is embedded under the verb “know”, in one of the readings, “to know Q ” is equivalent to know all the true answers in the denotation set. “How” questions can certainly be embedded under the verb “know”, and we want to see what the corresponding true answer set is. Suppose that in the actual world Jones buttered the toast slowly and absentmindedly. Should we represent the true answer set informally as in (13) and formally as in (14)?

² Note in the formula I used the symbol “ \wedge ” as in intensionalizer. In the event semantics, there is no explicit use of possible worlds, and therefore I will not go into the details here either, and instead I will assume that the “ \wedge ” turns the formula into a proposition.

³ I use the letter s to represent the type of an event. It is not to be confused with the use of this letter s in a possible worlds semantics.

- (13) {that Jones buttered the toast slowly,
that Jones buttered the toast absentmindedly.}
- (14) $\{^{\wedge} \exists e. [\text{Buttering}(e) \wedge \text{Agent}(e, \text{Jones}) \wedge \text{Patient}(e, \text{toast}) \wedge \text{Slow}(e)],$
 $^{\wedge} \exists e. [\text{Buttering}(e) \wedge \text{Agent}(e, \text{Jones}) \wedge \text{Patient}(e, \text{toast}) \wedge \text{Absentminded}(e)]\}$

Actually if we represent the true answer set as in (13) and (14), it gives the wrong interpretation of the question. In (14), the event argument is existentially closed, but these could potentially be different events. Thus what (14) says is that there is a slow buttering event and there is an absentminded buttering event, but it does not entail that these two are the same event. Supposedly, the same event of buttering can be both slow and absentminded. This is the same problem we see in (10). In contrast, argument-type wh-questions might not have such “identity” problems. For example, if you ask a “who” question like in (15), you can answer with a sentence like (16), even if the going-to-party is one event. The whole going-to-party event can be regarded as having separate smaller going-to-party events. One of these is the Adam going to the party and the other is Bill going to the party.

- (15) Who went to the party?
- (16) Adam went to the party, and Bill went to the party too.

Then if we represent these true answers using the event semantics, it does not create a problem as to the identity of events, since they are not necessarily the same event, as shown in (17).

- (17) $\{^{\wedge} \exists e. [\text{Going-to-party}(e) \wedge \text{Agent}(e, \text{Adam})],$
 $^{\wedge} \exists e. [\text{Going-to-party}(e) \wedge \text{Agent}(e, \text{Bill})]\}$

Therefore clearly (14) is wrong. Then how can we represent the true answers to manner “how” questions along the lines of the event semantics without running into trouble with regard to the existential closure of the event argument? My proposal is simply the following. If Jones buttered the toast slowly and absentmindedly, then there is only one such event and there are multiple adverbial modifiers, which can be simply treated as equal conjuncts, for example:

- (18) {that Jones buttered the toast slowly and absentmindedly}
 (19) $\{^{\wedge} \exists e. [\text{Buttering}(e) \wedge \text{Agent}(e, \text{Jones}) \wedge \text{Patient}(e, \text{toast})$
 $\wedge [\text{Slow}(e) \wedge \text{Absentminded}(e)]]$

The difference between (14) and (19) is that (19) is a singleton set with just one proposition about one event of toast-buttering which can be described in different ways, such as being slow and absentminded. This is indeed the correct representation of the denotation of manner questions.

Thus taking the difference between argument-type wh-questions and manner “how” questions into account, I will revise the first version of the denotation of “how” questions shown in (12) and propose the new version as follows:

- (20) $\{p \mid \exists \mathcal{P}. [p = ^{\wedge} \exists e. [\text{Buttering}(e) \wedge \text{Agent}(e, \text{Jones}) \wedge \text{Patient}(e, \text{toast})$
 $\wedge [\forall P \in \mathcal{P}. P(e)]]]\}$

In (20) the curly P ranges over sets of properties of events. Thus an example of true answers according to (20) could be (21).

- (21) { that Jones buttered the toast slowly and beautifully,
that Jones buttered the toast quickly, carelessly, and absentmindedly,
that Jones buttered the toast slowly, happily, clumsily and amusedly. }

The set of answers in (21) is the Hamblin denotation of possible answers. The way of deriving the Karttunen set of true answers is by adding a conjunct $p(w)$ to Hamblin denotation. However in “how” questions, I have shown that there is just one true answer to a “how” question. Therefore by simply adding the conjunct $p(w)$ to the formula in (20), we do not necessarily get exactly one true answer. There has to be something that will distinguish the interpretation of the conjunct $p(w)$ in “how” questions from the its interpretation in the argument-type questions. My proposal is that manner “how” questions presuppose a single event, and it is this presupposition that will restrain the number of true answers.

To be more specific, I formulize the presupposition as follows:

- (22) Event-Singularity Presupposition (ESP)

An adjunct-type wh-question, e.g. manner “how” is about one event.

Some clarifications are in order now. First, I suspect that this presupposition of a single event is true for all adjunct-type wh-questions. Although I am only dealing with manner “how” questions here, I will formulize the ESP as in (22), leaving further investigation in other types of adjunct wh-questions for another occasion. Second, the

ESP states that there is a presupposed event, and also that there is only one event. In what follows I will give more evidence to this presupposition in “how” questions.

First, consider the contrast between a nonfactive verb and a factive verb.

- (23) a. John said that she danced. (But in fact she didn't.)
b. John knows that she danced. (#But in fact she didn't.)

The verb “say” is nonfactive, and the embedded clause does not have to be true. Therefore the continuation with a denial of the embedded clause is ok, as shown in (23)-a. But a factive verb like “know” presupposes the truth of the embedded clause, and it cannot be felicitously uttered with the continuation of the denial of the truth of its embedded proposition, as shown in (23)-b. Now consider the following examples with another nonfactive verb “tell”.

- (24) a. John told me that she danced at the party last night. (But in fact she didn't dance at all.)
b. John told me how she danced at the party last night. (#But in fact she didn't dance at all.)

Since “tell” is a nonfactive verb, we would expect that there is no presupposition of the truth of its embedded proposition. This is indeed so in (24)-a. But if we replace “that” with “how”, the continuation with a denial of the truth of the embedded clause becomes bad, as shown in (24)-b. Since the only difference between the two sentences lies in the use of “how”, we can conclude that the presupposition in (24)-b is due to the use of “how”. This shows that “how” triggers a factive presupposition of an event.

Although the above examples show that “how” questions presuppose the existence of an event, it doesn’t show that there should be only one such event. For example:

(25) How did everyone dance?

If there is a quantifier in a manner “how” questions, then it seems to suggest that it is about a multitude of events, instead of just being about one. Actually, (25) can be ambiguous. If “everyone” takes narrow scope with respect to the “how”, then we get a question asking about the manner of the collective dancing event by everyone. In this sense, the “how” question is still about one single event. It can be answered with a single adverb, e.g. “Passionately”. If “everyone” takes wide scope, then we get a question asking about each person. This seems to pose a problem for the ESP. Such readings are called quantifying into questions. Semantically they are problematic, and therefore linguists try to explain such phenomena in different terms so that there will be no quantifying into questions. According to Krifka (2001), the wide-scope reading of “everyone” in a question should be regarded as a simplified way of asking a bunch of questions at the same time. He calls this “quantifying into question acts). For example:

(26) What did everyone buy?

(27) What did Adam buy? What did Bill buy? ...

The question (26) is equivalent to asking the series of questions in (27). Similarly, in the wide-scope reading for “everyone” in (25), it can be regarded as asking a series of questions, each of which is about a single event. Therefore narrow-scope readings for

quantifiers do not contradict the ESP. Wide-scope readings for quantifiers are excluded if in general there is no quantifying into question. Thus it has been shown that the presupposed event should be just one. This is exactly what the ESP means and it is what limits the number of true answers to “how” questions in the Karttunen semantics to one.

Additional evidence for the existence of ESP can be found in other languages, e.g. Mandarin. There is a syntactic distinction between two different constructions for the past tense in Mandarin. One of the constructions uses the perfective aspect marker *–le* to indicate a past event, the other uses “*shi...de*” (“it is... that...”) similar to the English cleft sentences. For argument questions only *–le* is possible, while the use of “*shi...de*” results in uninterpretable sentences. They are not just ungrammatical, but they have no interpretation at all. For example:

(28) a. Ni zuotian zuo shenme le?

You yesterday do what PRF

What did you do yesterday?

b. *Ni zuotian shi zuo de shenme?

You yesterday be do DE what

Intended reading: What did you do yesterday?

(29) a. Ni zuotian kanjian shei le?

You yesterday see who PRF

Who did you see yesterday?

b. *Ni zuotian shi kanjian shei de?

You yesterday be see who DE

Intended reading: Who did you see yesterday?

On the other hand, wh-adjunct questions with “how”, “when” and sometimes “where”⁴ can be used with “shi...de” only, and similarly, the use of *-le* results in uninterpretable sentences. For example:

(30) a. Ni shi zenme qu de Niuyue?

You be how go DE NYC

How did you go to NYC?

b. * Ni zenme qu-le Niuyue?⁵

You how go-PRF NYC

Intended reading: How did you go to NYC?

The “shi...de” construction is similar to the English cleft construction “it is... that”. The Mandarin construction is often said to emphasize the part between the two words. Yet another prerequisite of using this construction is that there should be a topic event, which is the part of the sentence minus the immediate constituent right after the “shi”. For example in (30)-a, the emphasis is on “zenme”, but the rest of the sentence “ni qu Niuyue” (“You went to NYC”) is the topic event. If the Mandarin wh-adjunct questions are to be uttered out of the blue, they sound very odd, because they carry a presupposition that there is a single topic event. Therefore the hearer will have to accommodate such a presupposition, by assuming that there is a relevant event.

The Mandarin data show that there is a distinction between “how” questions and the argument-type wh-questions in terms of their event presupposition. Also the cleft construction *shi...de* presupposes that there is a topic event. Manner “how” is the

⁴ “Where” can be either an argument or an adjunct, depending on the predicate that is used. But somehow “why” questions can be used both with the aspect marker *-le* and with “shi...de”.

⁵ This sentence is uninterpretable if *zenme* means “how”. This word, however, can mean “why” in some cases, which make it compatible with *-le*.

focus of the question and the rest is presupposed. Thus we conclude that “how” questions do presuppose a single event, which is the ESP.

Now if we want to derive the true answer set from (20), this is when the ESP comes into play. According to the ESP, adjunct questions should be about a single event, and hence the different propositions in (21) cannot be adjoined, and we can only choose one of them according to the actual state of affairs of the actual world. Suppose in the actual world Jones buttered the toast slowly and beautifully. Then the true answer set will just be a singleton set containing the first proposition in (21).

Now I have shown my proposal of the semantics of “how” questions within the framework of event semantics, similar arguments can be made for states. For example:

- (31) a. How does Caesar love Brutus?
 b. He loves him wholeheartedly and foolishly.
 c. {that Caesar loves Brutus wholeheartedly and foolishly}
 d. $\{^{\wedge} \exists s. [\text{Loving}(s) \wedge \text{Subject}(s, \text{Caesar}) \wedge \text{Object}(s, \text{Brutus}) \wedge \text{Wholehearted}(s) \wedge \text{Foolish}(s)]\}$

The sentence in (31) is a “how” question with states. (31)-b is a possible answer. It corresponds to the singleton set in (31)-c. (31)-c can be represented as (31)-d, which is similar to the event-based “how” questions.

In summary, manner “how” questions denote a set of answers which are about the properties of events. In this respect they are similar to argument questions. But there is a presupposition of a singular event in asking such an adjunct question, which is corroborated by the factive presupposition of embedded “how” questions in English and the exclusive use of the cleft construction in Mandarin “how” questions. This presupposition results in a singleton set which contains only one true proposition in

the Karttunen-style semantics. Similar arguments can be extended to questions with states.

In the rest of the chapter, I will apply the semantics and the ESP of “how” questions to various phenomena, and show that explanations to these phenomena follow naturally from the semantics of such questions.

5.3 Asymmetry of the Use of “All” as an Exhaustive Marker

In many languages the word glossed as “all” can be used in a wh-question to indicate that an exhaustive answer is required. Thus it seems to be a fairly common phenomenon in natural languages. Yet the word “all” can only be used in questions with “who”, “what” and sometimes “where”, but not in questions with “how”, “why” and “when”. This asymmetry seems to be related to the usual argument-adjunct asymmetry. There is, however, no structural reason why there is such an asymmetry. I will explain this phenomenon from a semantic point of view using the semantics of manner questions given in Section 5.2.

First let’s consider the following sentences. McCloskey (2000) observes that most varieties of English allow questions as shown in (32).

(32) McCloskey (2000:58)

- a. What all did you get for Christmas?
- b. Who all did you meet when you were in Derry?
- c. Where all did they go for their holidays?

The word “all” indicates that an exhaustive answer is needed. Take (32)-a as an example. If I got only three things for Christmas: an iPod, a Mozart CD, and a book by Dan Brown, then the appropriate answer would be “I got an iPod, a Mozart CD and a

book by Dan Brown”. By contrast a question without this “all” does not require the most exhaustive answer, and the hearer can give as much information as he is willing to, and there is no obligation of any sort. On the other hand, there are also non-exhaustivity markers, as pointed out by Beck and Rullmann (1999).

(33) Who for example was at the party last night?

(Beck & Rullmann 1999:286)

In (33) the phrase “for example” indicates that no exhaustive answer is needed. Such readings are called “mention-some readings”. For our purposes here, only the exhaustive marker “all” is of interest, because there is a cross-linguistic generalization about the distribution of this marker. This use of “all” can be found in many other languages, e.g. German, Dutch and Mandarin.

(34) German invariant *alles*, Reis (1992: 465)

Wen alles hat Hans besucht?

Whom all has Hans visited

Who all has Hans visited?

(35) Dutch *allemaal*, Beck & Rullmann (1999: 287)

Hij weet wie er allemaal op het feest waren.

He knows who there all at the party were

He knows who all were at the party.

(36) Mandarin *dou*

Ni dou xihuan shei?

You all like who

Who all do you like?

These data show that there is a parallel in these languages as to the use of the exhaustivity marker “all”. Nonetheless there are some restrictions as to the distribution of this marker. In questions with “how” and “why”, the use of “all” makes the sentence less acceptable. For example:

(37) English⁶

a. *How all did you answer the question?

b. *Why all did you go there?

(38) German

*Wie alles hat Hans seine Freunde besucht?

How all has Hans his friends visited

*How all has Hans visited his friends?

(39) Dutch⁷

*Hoe heb je allemaal gedanst?

How have you all danced?

*How all have you danced?

(40) Mandarin

a. ??Ni dou zenme jiao-de zuotian-de ke?

You all how teach-DE yesterday's class

How all did you teach yesterday's class?

b. Ni dou zenme jiaoke?

You all how teach

How all do you teach (your classes e.g. in general)?

⁶ Professor John Whitman, *pc.*

⁷ Prof Hotze Rullmann, *pc.*

McCloskey (2000) points out in his footnote 2 that *why all* and *how all* are both impossible, as is shown above. Reis (1992) also says the same thing about German. Her footnote 26 reads “some wh-phrases do not allow for quantification, cf. ?*wann alles/*warum alles, *wieso alles, *wie alles, *wie(teuer/groß, etc.) alles. The reasons for this are partly obscure.”⁸ As for the Mandarin example in (40), the question is okay if the “all” quantifies over times, and the question asks about all previous times of teaching a class. In this case the “all” is not related to “how”, as shown in (40)-b. In (40)-a the question is about a particular class, and the use of the “all” makes the sentence less acceptable.

From the data gathered here, it seems that “all” can be used with an argument question, but not with an adjunct question. Since there is no apparent syntactical reason, McCloskey suspects that “this must ultimately reflect the special denotational properties of *why* and *how*.” This is also how I try to account for this phenomenon here.

Beck and Rullmann (1999) suggest the following semantics for *alles/allemaal*:

$$(41) \quad \text{alles}(w)(Q) = \lambda p. [p = \text{answer1}(w)(Q)]$$

Their definition of *answer1* is as follows:

$$(42) \quad \text{answer1}(w)(Q) = \cap \{ p: Q(w)(p) \wedge p(w) \}$$

According to them, (42) is the conjunction of all true propositions in the question extension, i.e. the Karttunen-style set. Therefore (41) means that *alles* operates on a

⁸ *Wann*: when; *warum/wieso*: why; *wie*: how; *teuer*: expensive; *groß*: large.

question denotation and yields a (weakly) exhaustive interpretation. This process can be illustrated as in (36):

(43) Semantics of “all”

Q: Who all went to the party?

→ All [who went to the party]?

→ \llbracket who went to the party \rrbracket

= {that Adam went to the party,

that Bill went to the party,

that Chris went to the party.}

→ Answer1 = {that Adam went to the party

\wedge that Bill went to the party

\wedge that Chris went to the party}

→ all \llbracket who went to the party \rrbracket =

{that Adam went to the party and that Bill went to the party and

that Chris went to the party}

Now let me try a semantic analysis of “how” questions along the lines of Beck and Rullmann (1999). Suppose the question (44) is asked, and the true answer is that John danced fast and beautifully. The word “all” is supposed to operate on a conjunction of multiple propositions. There is, however, no conjunction of multiple propositions in the answer1 of (44).

(44) a. How all did John dance?

b. all [how did John dance]

c. all $\{^{\wedge} \exists e. [\text{dancing}(e) \wedge \text{Agent}(e, \text{John}) \wedge \text{Beautiful}(e) \wedge \text{Fast}(e)]\}$

To phrase it in a more straightforward way, “all” is supposed to operate on the true answer set of a question, and quantify over all of the true answers in that set. In the case of the “how” question like (44), the true answer set contains only one proposition, as is a result of the ESP. Therefore there is a conflict between “all” and the answer denotation. This conflict is in line with the following example with “which”:

(45) *Which all did you buy at the auction yesterday?

“Which” has a singularity presupposition, just as manner questions do. Therefore “how all” is ruled out on the same ground as “which all” is.

In this section, I point out that there is a systematic cross-linguistic asymmetry in the use of the exhaustive marker “all” with wh-questions. Then modeling my analysis on Beck and Rullmann’s (1999) analysis of the German *alles*, I argue that there is a conflict between the denotation of “how” questions and the uncanceled singularity presupposition of “all”.

5.4 The Problem with Choice Functions

This section addresses the problem pointed out by Reinhart (1998), and discusses in more detail the claim by Szabolcsi and Zwarts (1993) that manners are free join semi-lattices. Reinhart derives the right scope reading for wh-in-situ using the choice function. The ungrammaticality of adverbial adjuncts in situ is said to be a conflict between the choice function and the denotations of these wh-adjuncts. But she left the problem there without going into the details of this conflict, only citing Szabolcsi’s claim about the higher-order entities. I will try to explain the nature of this conflict in some detail here.

Reinhart (1998) discusses the logical form of wh's-in-situ. One of her key examples is:

(46) Who will be offended if we invite which philosopher?

In (46) the wh-phrase “which philosopher” stays in situ. In the minimalist program, a wh-in-situ does not move for economy reasons if they can be interpreted in the original place. Therefore a possible logical form for (46) would be (47):

(47) for which $\langle x, y \rangle$, if we invite y and y is a philosopher,
then x will be offended.

But (47) is definitely wrong. For example, if we invite Donald Duck, then the antecedent clause in the conditional is false, and hence the whole conditional is true. This means any non-philosopher will be a good answer here. It cannot be right! The right logical form should probably be:

(48) for which $\langle x, y \rangle$, y is a philosopher, and if we invite y , x will be
offended.

In (48), the NP restriction has moved out of the conditional. It gives the right interpretation of the question in (46). This movement analysis, however, is not desirable for minimalist considerations.

Now there is a dilemma: to move or not to move? If it does not move, there will be a wrong interpretation; if it does move, there will be a less desirable theoretical result. To solve this puzzle, Reinhart resorts to choice functions. Choice functions

apply to a non-empty set and yield an individual member of the set. The logical form of (46) using a choice function can be represented as:

- (49) For which $\langle x, f \rangle$, $(CH(f) \wedge (\text{we invite } f(\text{philosopher}) \rightarrow x \text{ will be offended}))$.

In (49), the NP restriction “philosopher” stays in situ, and the choice function applies to the set of philosophers and yields an individual philosopher.

Since adjunct adverbials like “how” are never good in situ, as shown in (50), we need to explain why they are incompatible with the choice function.

- (50) *Who arrived how?

She gives the following explanation to this problem.

One thing that would be agreed upon in all frameworks is that wh adverbials are different from wh-NPs. First, because they do not have an N-set, hence no N-role or variable; and second, because they denote functions ranging over higher-order entities (Szabolcsi and Zwarts 1993). This entails that they cannot be interpreted via choice functions selecting an individual from a set (since there is neither a variable that can be bound by forming a set nor a set of individuals that the choice function could apply to).

——Reinhart (1998: 45)

Her point is that wh-adverbials do not involve individuals and cannot be in the domain of choice functions. Then what does “how” range over? According to the semantics I

proposed in (20), “how” ranges over sets of properties of events. The denotation of wh-adverbials should be sets of sets of properties. They are higher-order entities, which are not in the domain of choice functions. Szabolcsi and Zwarts’s (1993) propose that manners denote a free join semilattice, which is a structure like the following:

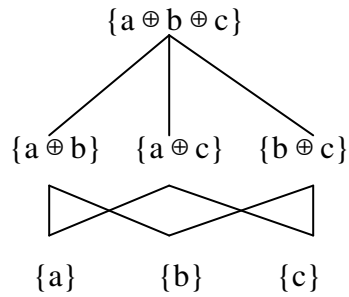


Figure 5.1: Free join semilattice

Szabolcsi and Zwarts (1993) say that the structure in Figure 5.1 “has been proposed as the denotation domain of mass terms and plurals-as-collectives (see Landman 1991, pp. 254-267; 317-324 for a summary). We propose to add manners.” But how do manners resemble mass terms? Rullmann (1995) has the following comment:

(51) Rullmann’s (1995) comment (p35)

“For instance, it is unclear exactly what the evidence is for claiming that a certain denotation domain has a certain algebraic structure. Manners are said to form a free join semilattice, structure in which join is defined, but complement and meet are not. The only evidence for this claim appears to be the fact that, according to Szabolcsi and Zwarts, extraction of *how* is blocked both by negation and by universal quantifiers. Now note that this kind of reasoning is in danger of being circular.”

It does seem that Szabolcsi and Zwarts are not quite clear about their claim of the semantics of manners. In light of my proposal here, I want to try to spell out the link between mass terms and manners. As shown in (20), a manner is a set of manner adverbs. Suppose we have the following adverbs: *fast*, *beautifully* and *professionally*. Each is a property of events, i.e. a set of events that have the corresponding property. Thus we have:

- (52) fast: {e1, e2, e3, e4 ...}
 Beautiful: {e1, e2, e3, e4 e6, ...}
 Professional: {e2, e3, e4, e6,...}
- (53) Fast, beautiful and professional: {e2, e3, e4}

The adverbs in (53) can be said to be a manner, and it is a set of events. It is however not quite obvious how the set of events in (53) is similar to mass terms, while on the other hand the only comparison that seems possible is between this set of events and plural individuals. According to Link (1983) plural individuals are indeed ordered structures such as a lattice. But as to the details of what kind of lattice structure it is, I will not have more to add here. I only want to point out some possible links between manners and lattice structures using the semantics that I have proposed in this chapter.

In summary, this section addresses the problem of the incompatibility between choice functions and the denotation of wh-adverbials. It is shown that wh-adverbials like “how” denote sets of sets of predicates. Such higher-order entities are not in the domain of a choice function. This explanation substantiates Reinhart’s (1998) suggestion and it falls out directly from my proposal of the semantics of adjunct questions. I also discuss in more detail the claim by Szabolcsi and Zwarts (1993) that manners are free join semi-lattices.

5.5 Quantificational Variability

In this section, I show how my proposal on manner questions can explain the unavailability of quantificational variability in “how” questions.

Quantificational variability originally refers to the lack of quantificational force of indefinites. For example:

(54) Lahiri (2002: 64)

- a. A man rarely loves his enemies.
- b. A man usually hates his enemies.
- c. A man sometimes loves his enemies.

The indefinite NP “a man” can be said to have different quantifiers in (54)a-c. In (54)-a it can be paraphrased as “few men”; in (54)-b as “most men” and in (54)-c as “some man”. Berman (1994) observes that in some cases embedded questions can be argued to show the same variability. For example:

(55) Lahiri (2002: 64)

- a. Sue mostly remembers what she got for her birthday.
- b. Bill knows, for the most part, what they serve for breakfast at Tiffany’s.
- c. With few exceptions, John knows who likes Mary.

In (55), the wh-pronouns in the embedded questions are argued to be similar to indefinites and they show quantificational variability with respect to a phrase of quantification in the matrix clause, e.g. mostly, for the most part, and with few exceptions.

Lahiri (2002) also notes that “how” questions are slightly odd with a quantificational phrase in the matrix clause. For example:

(56) Lahiri (2002: 144)

- a. ? John mostly knows how Bill fixed the car.
- b. ?John knows, for the most part, how Bill fixed the car.
- c. ?John partly knows how Bill fixed the car.

He used the analytic type of “how” questions. But the manner questions are equally odd here. For example:

- (57) ? John mostly knows how Bill danced.
 ? John knows, for the most part, how Bill danced.
 ? John partly knows how Bill danced.

Now the question is how we can explain this asymmetry. One way of explaining the quantificational variability of sentences in (55) is to treat the *wh*-pronouns as indefinites. The other possibility is to treat the quantification as over the propositions in the answer set. If we go with the latter, then the lack of quantificational variability in “how” questions is obvious, since according to the semantic denotation I propose in this chapter, there is only one true answer in the denotation set of manner questions. Therefore there are not multiple propositions to quantify over, e.g. by *most*.

5.6 Summaries

In this chapter, I propose an event semantic characterization of manner questions. Then it is applied to explain three sets of linguistic data: (1) the asymmetry

of “all” quantification over answers; (2) the incompatibility of “how” with choice functions; (3) the lack of quantificational variability in “how” questions. It is shown that there is only one true answer in the denotation set of manner questions and a manner is a free join semi-lattice. These special semantic properties of manner questions are the key to solving the above-mentioned problems, since they resist a purely syntactic explanation along the lines of the theory about argument-adjunct asymmetry. In this chapter I only deal with the “prototypical” cases of “how” questions, i.e. manner questions. I think that other types of “how” questions and other types of wh-adjunct questions, such as “why” questions, can be studied in a similar way, and my proposal about manner questions might be carried over to the study of these other types of questions as well.

CHAPTER 6

VERBAL HOW QUESTIONS

In Mandarin, there is a special type of “how” questions in which “how” is used as a verb. This would be equivalent to saying “John how-ed Bill?” in English. I call this type of questions the verbal “how” questions. In the literature on Mandarin questions, little attention is paid to such questions. But they have some very interesting properties, and also they have some parallel to the manner “how” questions. Therefore in this chapter, I will continue my study on “how” questions in Mandarin, focusing on the verbal “how” questions. I will show that such verbal uses of “how” have the same semantics as the manner “how” questions, in that the same “how” denotes properties of events. The difference is that in manner “how” questions there is an event-singularity presupposition and this presupposition raises the type of “how” to sets of properties of events, while in the verbal “how” questions, there is no such constraint. I will propose a simple semantic representation for such questions. Then I will discuss three special properties of the use of such verbal “how” questions. The first one is that they cannot be negated. I show that it follows naturally from the context of use and the semantics of such questions. The second property is that such questions have to be used in affective contexts. When it is used as a one-place predicate, the subject is in some sense the object of the verb, hence giving rise to a passive voice reading. The third property is that the verbal “how” questions cannot be used in a ditransitive construction. I will propose to analyze the verbal “how” as ranging over transitive verbs in the lexicon, and this fact can account for the latter two properties mentioned above.

This chapter is structured as follows. Section 6.1 describes the basic data and the three special properties or in other words constraints of use of such verbal “how”

questions. In Section 6.2, I extend my analysis of the denotation of manner questions in Chapter 5 to verbal “how” questions. Section 6.3 is a brief explanation to the incompatibility of the verbal “how” with negation. Then in Section 6.4 I will give a comprehensive compositional semantics of such questions, based upon works by Berman (1994), Lahiri (2002), Kratzer (1996) and Jonah Lin (2004). In Section 6.5, the compositional semantics is used to account for the other two constraints of use, i.e. the malefactivity reading and the incompatibility with ditransitive constructions.

6.1 The Verbal “How” in Mandarin

In addition to the usual distinction between argument and adjunct wh-questions, there is a special type of wh-questions in Mandarin with the verbal use of “how” as the head of a VP. This makes the distribution of wh-questions complete. I will explore their special properties in this chapter.

The wh-word *zenme* in Mandarin can be used in a manner wh-question as I have shown in Chapter 5. Here is another example.

(1) Yuehan zenme da-de Taijiquan?

John how hit-DE Taichi

How did John practice Taichi?

The same word *zenme* can also be used as the head verb of a VP, as shown in (2).

(2) Yuehan zenme-le Bi'er?

John how-PRF Bill

What did John do to Bill?

In such questions, the word *zenme* is used as a transitive verb. The issue here is about the semantic representation of such questions, along the lines of Hamblin (1973). In this chapter, my focus is on proposing an event semantics for the denotation of such verbal *zenme* questions. I will also explain some special properties of such questions, using this event semantics.

Before moving on to further details, I want to describe the typical contexts in which such questions are used in Mandarin. The contexts will help us understand some of the special properties of these questions, which I will deal with later in the chapter. The use of such questions in Mandarin typically involves a scenario in which the speaker arrives at the location of an event which just happened. The speaker observes the situation and gets to know who the participants of such an event are. Then the speaker asks about the nature of such an event. Consider example (2). Suppose when I enter the room, I see John and Bill in the center of the room, and you near the door. The room is in a mess and Bill is throwing a beer bottle at John. Then I know something has just happened between John and Bill, which made Bill mad. In this scenario, I will use the question in (2) to ask you about the happening. Such questions differ from their English counterparts, as shown in the translation of (2), in that these Mandarin questions are normally used when the event has an adverse effect on the patient, while the English sentence could be neutral as to the nature of the event with regard to the patient. For a neutral predicate question like these, there are equivalent ways of asking them in Mandarin as in English. For example:

(3) Yuehan dui Bi'er zuo-le shenme?

John to Bill do-PRF what

What did John do to Bill?

Now I want to point out three special properties of these verbal “how” questions. First, these questions are not compatible with negation. For example:

(4) ?? Zhangsan mei zenme Lisi?

Zhangsan not how Lisi

What didn’t Zhangsan do to Lisi?

If uttered out of the blue, (4) is not acceptable. Only when there is a contextually salient set of events that are being considered currently can we use such a negated question. For example, suppose we are playing a computer game, in which there are five types of action that a person can perform. I didn’t see what Zhangsan did to Lisi in the game. In this scenario question (4) is good. Thus I call this property the “incompatibility with negation”.

The second property involves the one-place verb use of *zenme* in these questions. For example:

(5) Zhangsan zenme le?

Zhangsan how PRF

What happened to Zhangsan?

The question in (5) does not mean “what did Zhangsan do”, as we might expect at first sight. What it means is rather that Zhangsan is the patient of an event. In this sense, the question seems to be in the passive voice, although there is no overt marker. I call this property the “malefactivity reading”.

The third property is that *zenme* cannot be used as a ditransitive verb. For example:

(6) ??Zhangsang zenme le Lisi yiben shu?

Zhangsan how PRF Lisi one-CL book

What did ZS do to Lisi w.r.t a book?

(7) Zenme le?

How PRF

What happened?

In (6) the intended reading is one in which *zenme* is used as a ditransitive verb. It seems that such a use is not allowed. In (7) *zenme* is used, at least seemingly, as a zero-place verb. We have seen the uses of *zenme* as a one-place verb in (5) and a two-place verb in (2). Therefore if *zenme* can be used as just about any type of verbs, why is it that a ditransitive use of it is ruled out? I will call this puzzle, or property, “the unavailability of a ditransitive use”.

These are the facts that I want to explain in this chapter. Now first I will propose a semantic representation of such questions.

6.2 The Semantics of Verbal “How” Questions

In this section, I will extend my analysis of the manner “how” questions in Chapter 5 to the verbal “how” questions. The event semantics is the key to the semantic representation of the manner question. Here I will rely on the event semantics again. In order to find out the denotation of such verbal “how” questions, I want to consider typical answers to such questions. Then similarly to what I have done with the answers to manner questions, I will translate those answers into standard event semantics representations to determine what the verbal “how” ranges over.

Now let’s consider the example in (2) again, repeated here as (8).

(8) Yuehan zenme-le Bi'er?

John how-PRF Bill

What did John do to Bill?

What are the possible answers? By using such questions, the speaker knows that some things happened between John and Bill, and he wants to know what happened.

Therefore the following sentences can be good answers to (8).

(9) Yuehan da-le Bi'er.

John hit-PRF Bill

John hit Bill.

(10) Yuehan da-le Bi'er, ye ma-le Bi'er.

John hit-PRF Bill, also scold-PRF Bill

John hit Bill and also scolded Bill.

Thus based upon such possible answers, we can represent the denotation of (8) informally as in (11), or formally as in (12).

(11) {that John hit Bill,
that John scolded Bill,
.....}

(12) $\{p \mid \exists P. [p = \lambda e. [P(e) \wedge \text{Agent}(e, \text{John}) \wedge \text{Patient}(e, \text{Bill})]]\}$

In (12) the variable P ranges over type predicates of events. The distinction between the type predicate of an event and a particular event is similar to the type-token

distinction. Thus what (12) means is that there exists an event in which the agent is John and the patient is Bill, and the speaker asks what type of event it is.

Here a comparison with the manner “how” questions is in order. Since in both questions, it is the same wh-word *zenme* that is used. We would expect that both uses of this *zenme* range over similar semantic objects. It is indeed so, since both uses involve properties or type of events. But there is one crucial difference. I have argued that in manner “how” questions, there is a presupposition that says such questions can be about one and only one event. Thus in computing the Karttunen semantics of the manner questions, we would arrive at a singleton set that contains only one true answer. Consequently, the semantic object that the manner “how” ranges over is raised to sets of properties of events. In contrast there is no such event-singularity presupposition in the verbal “how” questions, and we see that the answers in (10) and (11) can have multiple events. The existential closure on the event arguments does not create the same identity problem as in the manner questions.

Now that I have examined the semantics of the canonical verbal how questions in Mandarin, I will turn to such questions in English, and try to explain why a simpler approach would not be appropriate. For example:

(13) What did John do to Bill?

This question expresses the same meaning as (8). Yet in the English question (13), the wh-phrase “what” occupies an argument position, i.e. the object of the main verb. Is (13) actually not a typical argument-type wh-question, and is it more like the verbal “how” questions in Mandarin, e.g. the one in (8)? Can (13) be characterized in the usual way in which argument questions are dealt with? Such an argument is put forward by Davidson (1967) as the obvious wrong way to go. Talking about the

sentence “Jones did it slowly, deliberately, in the bathroom, with a knife, at midnight”, he pondered over the pronoun “*it*”.

The “it” of “Jones did it slowly, deliberately, ...” seems to refer to some entity, presumably an action, that is then characterized in a number of ways. Asked for the logical form of this sentence, we might volunteer something like “There is an action x such that Jones did x slowly and Jones did x deliberately and Jones did x in the bathroom, ...” and so on. But then we need an appropriate singular term to substitute for ‘ x ’. The trouble is that we have nothing here we would ordinarily recognize as a singular term.

——Davidson(1967: 81)

Therefore it seems that English questions like (13) are in fact disguised predicate questions and more like the verbal “how” questions in Mandarin? Hence the English type of questions like the one shown in (13) should be analyzed in a way similar to (8). Since the Mandarin type of verbal “how” questions have a relatively easy and straightforward semantic representation, it might help us to understand the semantic of the English predicative *what* questions better.

In this section, I extend my analysis of manner questions to the verbal “how” questions. In what follows, I will show how this semantics can account for the special properties or constraints in the use of verbal “how” questions.

6.3 The Incompatibility with Negation

The verbal “how” questions in Mandarin are seldom negated. In fact this is related to the interaction between negation and the existential quantification in the

event-based semantic representation of such questions. Take (4) for example, repeated here as (14). If we take the negation as a sentential operator as commonly assumed, then we get the formula (15) for (14):

- (14) ?? Zhangsan mei zenme Lisi?
 Zhangsan not how Lisi
 What didn't Zhangsan do to Lisi?
- (15) [Not [ZS zenme LS]]

If we give a semantic characterization of (15) in the line of the event-based semantics I have proposed, we get the following:

- (16) $\{p \mid \exists P. [p = \neg \exists e. [P(e) \wedge \text{Agent}(e, \text{ZS}) \wedge \text{Patient}(e, \text{LS})]]\}$

Then what is the interpretation of (16)? It seems to be asking about something that cannot happen between ZS and LS, but this is not what (14) is about. Even if we add more specifications like time and location to make the formula more specific, it would mean “what are the things that didn't happen between ZS and LS?”. Theoretically there are an infinite number of things that didn't happen. By asking such a question, it is highly suspicious as to what the speaker wants to know. Pragmatically there is no felicitous answer to such an “infinite” question as well. But if somehow the question is made “finite” by the context, it could be an acceptable utterance. As I have pointed out in Section 6.1, this is actually the case, because the question is good when there is a contextually salient set of things that are being considered. Suppose we know that ZS either kicked LS, or hit LS or slapped LS, and we need to figure out which event occurred. Then by asking a question like (14) a speaker is asking a felicitous question.

6.4 Compositional Semantics of Verbal “How” Questions

In this section, I will give a compositional semantics of verbal “how” questions in Mandarin, and then show how the compositional approach accounts for the other two properties of such questions.

In Section 6.2, the logical representation of the denotation of the verbal “how” questions is given, based upon works by Hamblin (1973) and Parsons (1990). My theory, however, will not be complete until a compositional derivation which maps the relevant syntactic structures to the semantics is made available. There are two issues that should be solved before a successful derivation is made possible. The first issue is that the compositional semantics for wh-questions in the Quantificational theory that I discussed in Chapter 2 cannot be used directly for the Mandarin data, because I have shown that there is strong evidence against the LF movement analysis of Mandarin wh-phrases. The second issue is that the event semantics does not correspond to any obvious syntactic constituent in a linguistically realistic way. We need to modify the event semantics to fit in a linguistic theory of questions. To solve these two issues, I first modify the semantic rule for the Q morpheme proposed by Berman (1994). Then I discuss Kratzer’s (1996) modification on the event semantics and her derivational rules, especially the Event Identification rule. With these two issues cleared, I will give a compositional semantics.

The first task is to figure out whether the verbal “how” moves at LF or not. Even among those linguists who think there is LF movement in general in Mandarin, some would argue that wh-arguments do not move at all, while some wh-adjuncts might move at LF, creating island condition violations. The verbal how is neither in an argument position nor in an adjunct position. Is it similar to wh-arguments or wh-adjuncts, or is it different from both of them? I think these verbal “how” questions behave more like arguments, and if it is so, it is reasonable to assume that the verbal

“how” does not move at LF. In this section, I will try to propose an analysis along the lines of the Unselective Binding theory, which I discussed in Chapter 2. Although I have tried to use the Alternative Semantics theory to account for various phenomena in Mandarin throughout this dissertation, I will postpone a discussion of the applicability of that theory until I have worked out my “unselective binding” analysis.

First, one of the ways of showing that wh-arguments do not move at LF is that they do not obey the usual Island Conditions such as complex NP islands and sentential subjects. For example:

- (17) Yuehan xihuan shei xie de shu?
 John like who wrote DE book
 [who_i [John likes the book *who_i* wrote]]?
- (18) *Yuehan xihuan ni zenme xie de shu
 John likes you how wrote DE book
 *[how_i [John likes the book that you wrote *how_i*]]

In (17), the direct question reading is available, while in (18) it shows that the direct question reading is not available. If we assume that wh-adjuncts have to move at LF, then (18) is ruled out by the subjacency condition. Then what about the verbal “how” questions? I think they are better as direct questions in these island constructions. For example:

- (19) ?Yuehan xihuan Mali zenme-le de ren?
 John like Mary how-PRF DE person.
 ? [how_i [John likes the person that Mary how-ed_i]]

Although (19) is slightly odd, it is nonetheless much better than (18). Therefore it suggests that the verbal how in Mandarin patterns with wh-arguments. The following examples with the exhaustivity marker “dou” also show the same effect.

- (20) Yuehan dou xihuan shei?
 John all like who
 Who all does John like?
- (21) Yuehan dou zenme-le Mali?
 John all how-PRF Mary.
 What all did John do to Mary?
- (22) ?? Yuehan dou zenme da-de Taijiquan?
 John all how hit-DE Taichi
 *How all did John practice Taichi?

As shown in Chapter 5, the exhaustivity marker “all” is not compatible with a manner question. (22) is an odd sentence in Mandarin as well. But this exhaustivity marker is perfectly good with the argument question in (20) and the verbal how question in (21). This also suggests that the verbal how question patterns with the wh-argument question. If wh-arguments do not move at LF, it is a plausible assumption that the verbal how does not move either. Therefore one way of interpreting wh-in-situ is by binding through a Q morpheme.

As I have shown in Chapter 2, the semantics of the Q morpheme, e.g. the one proposed by Berman (1994) is problematic because the domain restriction of the wh-phrase needs to be extracted. Therefore if we want to use the Unselective Binding approach, we need to find a mechanism to extract the domain restriction while leaving the wh-phrase *in situ*.

Here I will make use of an idea from Abusch (1994). She discusses the scope of indefinites in English, and uses a special mechanism to carry the domain restriction of an indefinites up the syntactic tree and have them extracted when they are needed. The general schema is “ $\phi : U$ ”, where U is a set of indices of unquantified in-situ indefinites. For example, an indefinite NP would receive the translation in (23), while a definite NP would be translated as (24).

(23) arrive (x_1): {< x_1 , man(x_1)>} Indefinite NP

(24) arrive (x_1): { } Definite NP

The difference between an indefinite NP and a definite NP is the content of the U . In the above examples, the brackets in the translation of an indefinite NP contain the domain information, while the brackets in the translation of a definite NP are empty.

The domain restriction in the brackets will be carried up the syntactic tree until they are needed. For example, the sentence in (25) would have the derivation in Figure 6.1, where the domain restrictions on each of the indefinite NP are combined when they are carried up the tree.

(25) A man arrived and a woman left

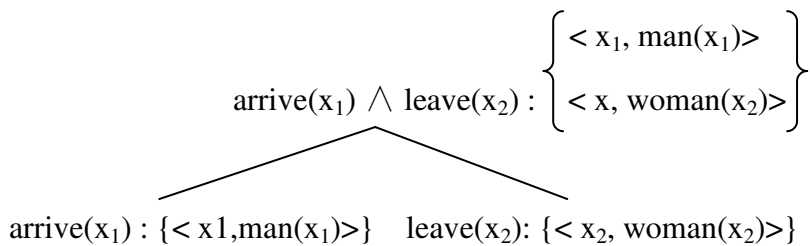


Figure 6.1: The derivation tree of indefinite DPs (Abusch 1994)

The syntactic structure in Figure 6.1 can be interpreted by the following existential closure rule (Abusch 1994).

(26) Existential Closure

Where $\langle x_{k1}, \phi_1 \rangle, \dots, \langle x_{kn}, \phi_n \rangle \in 2(X')$, the interpretation is:

$$\exists x_{k1} \dots \exists x_{kn} [\phi_1 \wedge \dots \wedge \phi_n \wedge 1(X')] : [2(X') - \{\langle x_{k1}, \phi_1 \rangle, \dots, \langle x_{kn}, \phi_n \rangle\}]$$

In the existential closure rule in (26), the functions 1 and 2 have the following definition:

$$(27) \quad 1(\phi : U) = \phi, \quad 2(\phi : U) = U$$

The function 1 returns the first element in the schema, and the function 2 returns the second element in the schema. By applying the existential closure rule to the syntactic structure in Figure 6.1, we can get the following interpretation, which is exactly the desired result of the derivation:

$$(28) \quad \exists x_1 \exists x_2 [\text{man}(x_1) \wedge \text{woman}(x_2) \wedge \text{arrive}(x_1) \wedge \text{leave}(x_2)] : \{ \}$$

Now in order to use the same mechanism to derive the semantics of the verbal “how” questions, I will propose a similar mechanism which would allow us to deal with the verbal “how” questions in a more straightforward way.

First I argue that wh-variables in the Mandarin-type languages are restricted variables which carry their domain information as superscripted predicates. Thus the lexical meaning of “who/shei” in such languages would be x^{PERSON} . Such type of variables can be interpreted via an unselective binder by the following semantic rule:

(29) Abstraction rule of restricted variables

If α is a branching node, $\{\beta, \gamma\}$ is the set of α 's daughters, β is an unselective binder Op , and γ contains a restricted variable x^D , then

$$\llbracket \alpha \rrbracket = Op\ x \text{ such that } x \in D. \llbracket \gamma (...x...) \rrbracket$$

Second, I give the following rule for the Q morpheme in the verbal how questions in Mandarin, which extracts the variables with the domain restrictions and turns the proposition into a set of propositions.

(30) Semantics of the Q morpheme

$$\llbracket Q \rrbracket = \lambda q. \lambda p. \exists x \text{ such that } x \in D. p=q$$

These semantic interpretation rules can be used to account for the unselective binding relation in wh-in-situ languages. Consider the derivation (32) of (31), an argument-type wh-question in Mandarin. The LF is shown in Figure 6.2.

(31) Yuehan xihuan shei?

John like who

Who does John like?"

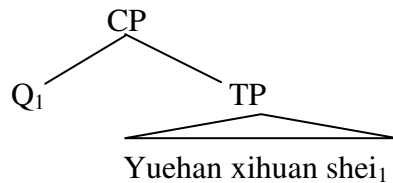


Figure 6.2: Tree structure of a Mandarin wh-question

(32) Step-by-step derivation

1. $\llbracket \text{xihuan} \rrbracket = \lambda x. \lambda y. \lambda w. \text{like}(x)(y)(w)$
2. $\llbracket \text{shei} \rrbracket = x^{\text{PERSON}}$
3. $\llbracket \text{TP} \rrbracket = \lambda w. \text{like}(x^{\text{PERSON}})(\text{Yuehan})(w)$
4. $\llbracket \text{Q} \rrbracket = \lambda q. \lambda p. \exists x \text{ such that } x \in \text{PERSON}. p=q$
5. $\llbracket \text{CP} \rrbracket = \lambda p. [\exists x \text{ such that } x \in \text{PERSON}. p = \lambda w. \text{like}(x)(\text{Yuehan})(w)]$

Now the task is to figure out how to apply this mechanism to the interpretation of the verbal “how” questions. Recall that the denotation of the verbal “how” questions is couched with the framework of event semantics. Therefore we need a general system to derive the logical representation of event semantics. To do this, I will use the compositional event semantics proposed by Kratzer (1996).

The neo-Davidsonian event semantics have predicates like “Agent” and “Patient”, which do not correspond directly to the argument structure of the verbs in overt syntax, and also not to any obvious syntactic constituent. Kratzer (1996) argues for an approach which is almost a mixed version of the original Davidsonian event semantics and the neo-Davidsonian semantics. In her theory, there are no predicates such as “Patient”. Instead, she favors the original Davidsonian representation which treats the patient DP just as an argument of the verb. As for the “Agent” predicate, it is introduced by a functional head. It is currently a general agreement among theoretical linguists that the external argument of a verb is actually not an argument of the verb. Instead it is introduced by a functional verb, which is either the light verb *v* in syntactic theories or the predicate Voice in Kratzer’s (1996) semantic theory. One of her illustrative examples is as follows:

(33) Mittie feed the dog (untensed sentence) (Kratzer 1996: 121)

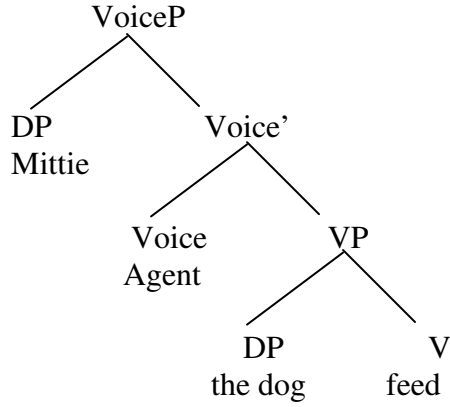


Figure 6.3: Tree with a VoiceP

(34) VoiceP: semantic interpretation¹

[1] **feed*** = $\lambda x_e \lambda e_s [\text{feed}(x)(e)]$

[2] **the dog*** = the dog

[3] **(the dog feed) *** = $\lambda e_s [\text{feed}(\text{the dog})(e)]$

(From (1), (2) by Functional Application)

[4] **Agent*** = $\lambda x_e \lambda e_s [\text{Agent}(x)(e)]$

[5] **(Agent (the dog feed))*** =

$\lambda x_e \lambda e_s [\text{Agent}(x)(e) \ \& \ \text{feed}(\text{the dog})(e)]$

(From (3), (4) by Event Identification)

[6] **Mittie*** = Mittie

[7] **((Agent (the dog feed)) Mittie)*** =

$\lambda e_s [\text{Agent}(\text{Mittie})(e) \ \& \ \text{feed}(\text{the dog})(e)]$

(From (5), (6) by Functional Application)

¹ The * stands for a translation to the denotation of an expression. The labels used for semantic types are as follows: e for entities, s for events, and t for truth values. The type label e is not to be confused with the event variable e.

The result of the derivation in step [7] is a property of events. The event variable can be existentially closed by a higher constituent, such aspect and tense. In the above derivation, the most crucial step the step [5], which involves Event Identification, as characterized in (35).

(35) Event Identification (Kratzer 1996: 122)

$$\begin{array}{ccc}
 f & g & \rightarrow h \\
 \langle e, \langle s, t \rangle \rangle & \langle s, t \rangle & \langle e, \langle s, t \rangle \rangle \\
 & & \lambda x_e \lambda e_s [f(x)(e) \ \& \ g(e)]
 \end{array}$$

With the two problems solved, I will give a sample derivation of a verbal how question in Mandarin, using the interpretative mechanism I proposed above and the event semantics propose by Kratzer (1996), with additional help from the semantics of the aspect marker *-le* proposed by Jonah Lin (2004). But the details of the semantics of aspect are not relevant here.

Consider the following compositional semantics for a typical verbal “how” questions. The tree structure of the question in (36) is shown in Figure 6.4, and then in (37), a detailed step-by-step compositional semantics is given. Most of the steps are self-evident without need of any explanation, and the rule of event closure will be given in (38).

(36) Zhangsan zenme-le Lisi?

Zhangsan how-ASP Lisi

What did Zhangsan do to Lisi?

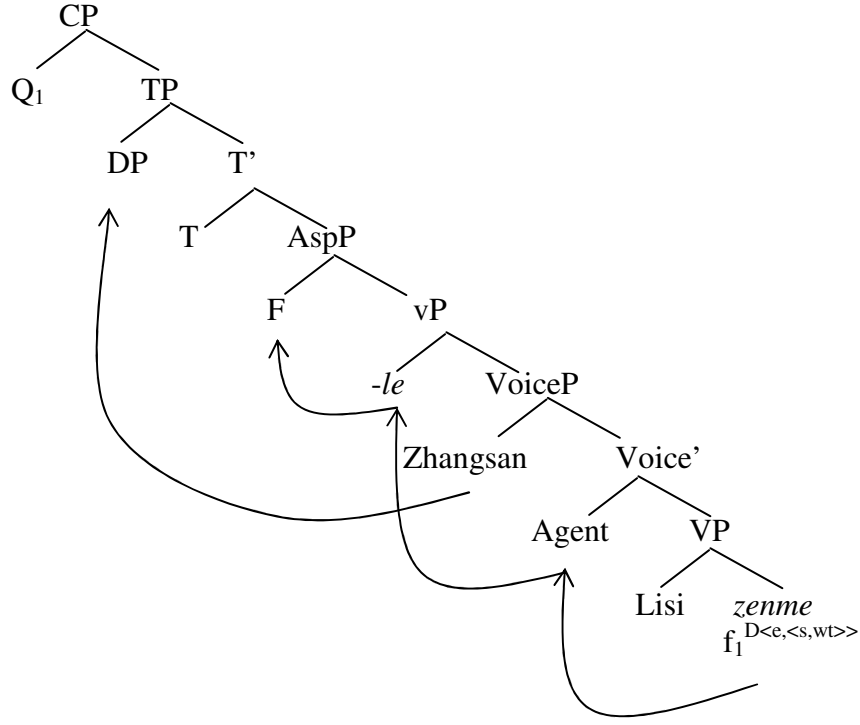


Figure 6.4: A sample derivation of a typical verbal “how” question

(37) Derivation steps²

- [1] $\llbracket \text{zenme} \rrbracket = \lambda x. \lambda e. \lambda w. f_1^{D\langle e, \langle s, wt \rangle \rangle} (x)(e)(w).$
- [2] $\llbracket \text{VP} \rrbracket = \lambda e. \lambda w. f_1^{D\langle e, \langle s, wt \rangle \rangle} (\text{Lisi})(e)(w)$
- [3] $\llbracket \text{Agent} \rrbracket = \lambda x. \lambda e. \lambda w. \text{Agent}(x)(e)(w)$
- [4] $\llbracket \text{Voice}' \rrbracket = \lambda x. \lambda e. \lambda w. [f_1^{D\langle e, \langle s, wt \rangle \rangle} (\text{Lisi})(e)(w) \wedge \text{Agent}(x)(e)(w)]$
- [5] $\llbracket \text{VoiceP} \rrbracket = \lambda e. \lambda w. [f_1^{D\langle e, \langle s, wt \rangle \rangle} (\text{Lisi})(e)(w) \wedge \text{Agent}(\text{Zhangsan})(e)(w)]$
- [6] $\llbracket -le \rrbracket = \lambda t. \lambda e. \lambda w. [F(t)(e)(w)]$
- [7] $\llbracket vP \rrbracket = \lambda t. \lambda e. \lambda w. [f_1^{D\langle e, \langle s, wt \rangle \rangle} (\text{Lisi})(e)(w) \wedge \text{Agent}(\text{Zhangsan})(e)(w) \wedge F(t)(e)(w)]$
- [8] $\llbracket F \rrbracket = \lambda t. \lambda w. \exists e [F(t)(e)(w)]$

² All of the type labels are the same as in (33). The variable w ranges over possible worlds. I also use the letter w as the type label for worlds, since the usual label s has already been used as that for events.

$$[9] \llbracket \text{AspP} \rrbracket = \lambda t. \lambda w. \exists e [f_1^{D\langle e, \langle s, wt \rangle \rangle} (\text{Lisi})(e)(w) \wedge \text{Agent}(\text{Zhangsan})(e)(w) \\ \wedge F(t)(e)(w)]$$

$$[10] \llbracket T \rrbracket = t_0 (\text{Speech Time})$$

$$[11] \llbracket \text{TP} \rrbracket = \lambda w. \exists e [f_1^{D\langle e, \langle s, wt \rangle \rangle} (\text{Lisi})(e)(w) \wedge \text{Agent}(\text{Zhangsan})(e)(w) \\ \wedge F(t_0)(e)(w)]$$

$$[12] \llbracket Q \rrbracket = \lambda q. \lambda p. \exists x \text{ such that } x \in D. p=q$$

$$[13] \llbracket \text{CP} \rrbracket = \lambda p. [\exists f \text{ such that } f \in D_{\langle e, \langle s, wt \rangle \rangle}. p = \lambda w. \exists e [f(\text{Lisi})(e)(w) \\ \wedge \text{Agent}(\text{Zhangsan})(e)(w) \wedge F(t_0)(e)(w)]]$$

Step [7] uses a rule similar to event identification. Step [9] uses the Rule of Event Closure from Jonah Lin's (2004). The event closure rule is:

(38) Rule of Event Closure (Jonah Lin 2004:629)³

$$\langle i, t \rangle + \langle i, \langle s, t \rangle \rangle \rightarrow \langle i, t \rangle$$

Condition: F must match

Finally the aspect feature F introduces the time dimension as in $F(t_0)(e)(w)$, which says the event e precedes the speech time in world w. One more clarification is that in both Kratzer's (1996) and Jonah Lin's (2004) derivations, they only deal with extensions of a sentence, while in my derivation in order to derive the semantics of questions as sets of propositions, I have added the world variable all along.

6.5 The Puzzles of Malefactivity and Ditransitive Use

The intransitive use of *zenme* in questions can only have a reading in which the subject is the patient of the event, as shown in my example (5), repeated here as (39).

³ The label i stands for times/time intervals.

- (39) Zhangsan zenme le ?
 Zhangsan how PRF
 What happened to Zhangsan?

This property is readily explained if we look at the derivation given in Figure 6.4. Since the Agent is not an argument of the verb, it does not have to be present. If the Voice does not merge with the VP, then the internal argument DP can move to the spec,TP position, hence deriving the passive reading. I give a derivation as follows:

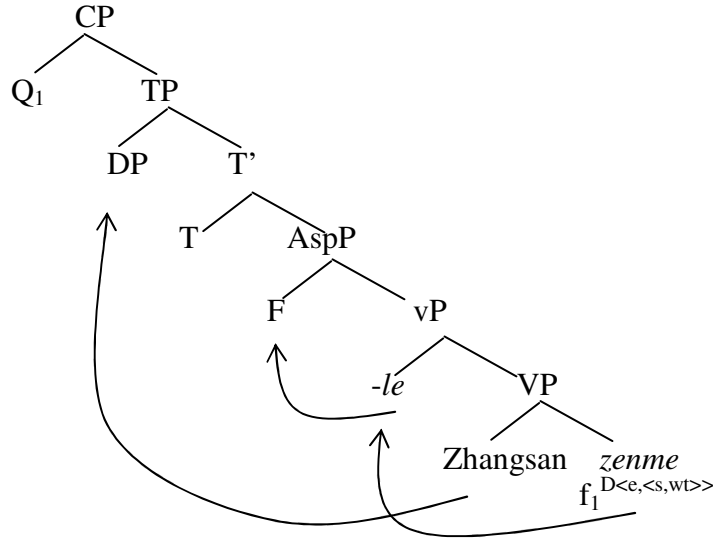


Figure 6.5: Derivation of the malefactivity reading

(40) Derivation steps

- [1] $\llbracket \text{zenme} \rrbracket = \lambda x. \lambda e. \lambda w. f_1^{D\langle e, \langle s, wt \rangle \rangle} (x)(e)(w).$
 [2] $\llbracket \text{VP} \rrbracket = \lambda e. \lambda w. f_1^{D\langle e, \langle s, wt \rangle \rangle} (\text{Zhangsan})(e)(w)$
 [3] $\llbracket \text{-le} \rrbracket = \lambda t. \lambda e. \lambda w. [F(t)(e)(w)]$
 [4] $\llbracket \text{vP} \rrbracket = \lambda t. \lambda e. \lambda w. [f_1^{D\langle e, \langle s, wt \rangle \rangle} (\text{Zhangsan})(e)(w) \wedge F(t)(e)(w)]$
 [5] $\llbracket \text{F} \rrbracket = \lambda t. \lambda w. \exists e [F(t)(e)(w)]$

- [6] $\llbracket \text{AspP} \rrbracket = \lambda t. \lambda w. \exists e [f_1^{D\langle e, \langle s, wt \rangle \rangle} (\text{Zhangsan})(e)(w) \wedge F(t)(e)(w)]$
- [7] $\llbracket T \rrbracket = t_0$ (Speech Time)
- [8] $\llbracket \text{TP} \rrbracket = \lambda w. \exists e [f_1^{D\langle e, \langle s, wt \rangle \rangle} (\text{Zhangsan})(e)(w) \wedge F(t_0)(e)(w)]$
- [9] $\llbracket Q \rrbracket = \lambda q. \lambda p. \exists x \text{ such that } x \in D. p=q$
- [10] $\llbracket \text{CP} \rrbracket = \lambda p. [\exists f \text{ such that } f \in D_{\langle e, \langle s, wt \rangle \rangle}. p = \lambda w. \exists e [f(\text{Zhangsan})(e)(w) \wedge F(t_0)(e)(w)]]$

In this derivation, the seemingly intransitive verb *zenme* is in fact still the same as the transitive *zenme*. Thus it should be the case that the predicative use of *zenme* is always a transitive one in the traditional sense, and its denotation should always be:

(41) Lexical entry for the verbal use of *zenme*

$$\llbracket \text{zenme} \rrbracket = \lambda x. \lambda e. \lambda w. f_1^{D\langle e, \langle s, wt \rangle \rangle} (x)(e)(w).$$

Then what about the zero-place use of *zenme*, as shown (7), repeated here as (42).

(42) Zenme le?

How PRF

What happened?

This should not be a surprise if we take it into consideration that in Mandarin the subject of a sentence can be dropped very freely if it could be retrieved from the context. As to the nature of this dropped subject, it could either be a free empty category in the sense of Xu (1986), or an empty topic in the sense of Huang (1982b). But that should not be a very important distinction for our purposes here. Therefore I will just use the symbol “e” to represent the empty subject. For example:

- (43) Chi-le ma?
 Eat-ASP Q
 Did you eat?
- (44) [e chi-le ma]

Unlike inflectional languages such as Spanish, there isn't any verbal inflection for person in Mandarin. As shown in (44), the empty subject is recovered from the context. The subject of a passive sentence can also be dropped. For example:

- (45) You bei laoshi ma le!
 Again BEI teacher scold PRF
 You/he/I were/was scolded by the teacher again.
- (46) [e you bei laoshi ma le]

Therefore, the interpretation of (42) should rather be as follows:

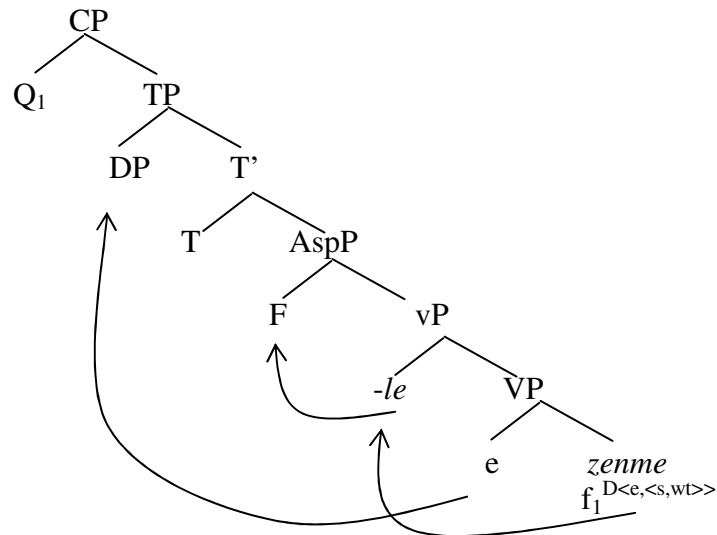


Figure 6.6: Derivation of zero-place use of the verbal “how”

Then how is the empty subject *e* interpreted? It should be a variable, the value of which should be assigned by the assignment function in the context. The Q morpheme should not bind the empty subject since it should be a free variable. This is guaranteed by the indexing, as shown in Figure 6.2. The Q morpheme only binds co-indexed restricted variables.

Does the interpretation in Figure 6.6 correspond to (42)? I think it does, since (42) is always asked of a person about what happened to him or her. In such scenarios the dropped *pro* is definitely the patient or the internal argument of the verb *zenme*. This is in fact a very common feature of second-person questions in Mandarin, i.e. the subject is understood from the context and is always omitted.

It is clear now that the verbal use of *zenme* is only a transitive one, which is stipulated in the lexicon. Therefore the unavailability of its ditransitive use falls out naturally from this lexical property.

There is also a pragmatic component to this issue, since we want to know why it is not stated in the lexicon that there are two *zenme* verbs, one of which is a ditransitive one. Recall the typical scenarios in which the verbal how questions are used, as I mentioned in Section 6.1. To use such questions, the speaker should have clues as to who the participants of the relevant event that he is interested in are. Obviously this information is available if the participants are animate beings which indicate their feelings and emotions outwardly, or behave in a telling way. On the other hand, a ditransitive construction is typically about an inanimate object which was transferred from the subject to the indirect object. Suppose John gave Bill a book. Then I enter the room, seeing that Bill is holding a book, and John is standing nearby. I have no clue as to the fact that the book was involved in the event that has just happened. Therefore we can say that the typical scenarios in which such questions are used rule out the use of a ditransitive *zenme* in normal situations.

6.6 Summaries

This chapter deals with a special type of questions in Mandarin, i.e. the verbal how questions. I have made the following proposals. First, in terms of the denotation of such questions, *zenme* is a higher order variable ranging over predicates/properties of events, and all of the rest of the story follows naturally from there, along the lines of Hamblin (1973). Second, the incompatibility of these questions with negation is readily explained due to the fact of the interaction between the sentential negation and the existential quantification over events. Third, I propose a mechanism based upon an idea by Abusch (1994) to interpret the Q morpheme, and then give a derivation of a typical verbal “how” question, which in turn explains in a straightforward way the puzzles of the malefactivity reading and the unavailability of the ditransitive use of *zenme*.

CHAPTER 7

SOME REMARKS ON WHY QUESTIONS

Adjunct-type wh-questions typically include “how” and “why” questions. I have discussed “how” questions in the previous two chapters, and in this chapter, I want to make some remarks on “why” questions. This chapter is still tentative. I will try to extend the analysis that I made about manner “how” questions to “why” questions. I will show that there are certain similarities between “how” and “why” in terms of their event structure and presuppositions. Thus it explains why “why” questions are not compatible with the exhaustivity maker “all” and also why they lack quantificational variability when embedded. I will also provide new data on the relation between the position of *weishenme* (“why”) and focus in Mandarin.

This chapter proceeds as follows. In Section 7.1, I discuss the semantics of “why” questions, and show how they can be used to explain certain facts. In Section 7.2 I will discuss the data between focus and “why”. Section 7.3 is a summary.

7.1 The Semantics of Causal “Why” Questions

“Why” questions can be classified into different types. For example, there are at least two types: purpose and causal.

- (1) Why do you want to go to the city?
- (2) Because I want to buy some nice clothes.

- (3) Why did you start taking guitar lessons?
- (4) Because my friends are all taking guitar lessons.

The question in (1) is asking for the purpose of going to the city, and the answer in (2) has a verb “want” which expresses the purpose. The question in (3) is asking for the cause of taking guitar lessons. The answer in (4) provides a cause of that. I will only discuss causal questions in this chapter.

The usual way of getting at the denotation of questions is by studying the forms of answers and generalizing across all the answers. Thus let’s consider some answers to causal why-questions.

(5) Why did Jane hit John?

(6) a. Because he slapped her first.

b. Jane hit John because he slapped her first.

The answers in (6)-a is a typical answer, while (6)-b is a more spelt-out version of (6)-a. Suppose (6)-b is the complete answer form, and the one in (6)-a is an elliptical answer. Then we can represent such answers as:

$$(7) \exists e. \exists e'. \text{hitting}(e') \wedge \text{Agent}(e', \text{Jane}) \wedge \text{Patient}(e', \text{John}) \wedge \\ \text{slapping}(e) \wedge \text{Agent}(e, \text{John}) \wedge \text{Patient}(e, \text{Jane}) \\ \wedge \text{CAUSE}(e, e')$$

The consequent event goes before the conjunctive “because” and the causing event goes after that. The conjunctive “because” expresses the causal relation. I use “CAUSE” to represent this relation.

The formula in (7) is quite cumbersome. I will introduce some simplifications to make the formula more readable. Suppose for the time being that we can abbreviate the complex structures in the event semantics into an n-tuple, with the elements

corresponding to the type, agent, patient, etc of the event. Thus an event of John slapping Jane would be abbreviated as:

$$(8) \exists e. e = \langle \text{hitting}, \text{John}, \text{Jane} \rangle$$

If there is no overt argument, we can use existential closure. For example:

(9) There was a beating at the park.

$$(10) \exists e. \exists x. \exists y. e = \langle \text{hitting}, x, y, \text{park} \rangle$$

(11) Someone beat someone else at the park.

Thus by making use of such abbreviations, we can simplify the representations in a causal relation, and the corresponding simplified version of (7) is now (12) :

$$(12) \exists e. \exists e'. e' = \langle \text{slapping}, \text{John}, \text{Jane} \rangle \wedge e = \langle \text{hitting}, \text{Jane}, \text{John} \rangle \wedge \text{CAUSE}(e, e')$$

Now we see that why-questions quantify over causing events, and the answers in the set should be propositions expressing a causal relation. Thus the semantics of (5) is as shown in (13), and the corresponding set of answers would be as shown in (14):

$$(13) \{ p \mid \exists e. \exists e'. e' = \langle \text{slapping}, \text{John}, \text{Jane} \rangle \wedge p = \text{CAUSE}(e, e') \}$$

$$(14) \{ \begin{array}{l} \text{that Jane hit John because he called her names;} \\ \text{that Jane hit John because he slapped her;} \\ \text{that Jane hit John because he kicked her;} \\ \dots \end{array} \}$$

What if the causes are that John called her names and slapped her, and neither one alone wouldn't cause Jane hitting John? Can we adjoin the first two propositions, as in wh-argument questions? For example:

(15) Jane hit John because he called her names and Jane hit John because he kicked her.

(16) $(\exists e. \exists e'. e' = \langle \text{slapping, John, Jane} \rangle \wedge e = \langle \text{hitting, Jane, John} \rangle \wedge \text{CAUSE}(e, e')) \wedge (\exists e. \exists e'. e' = \langle \text{kicking, John, Jane} \rangle \wedge e = \langle \text{hitting, Jane, John} \rangle \wedge \text{CAUSE}(e, e'))$

But the existential closure on the consequent event poses the same “identity” problem as in manner questions, i.e. the two events do not have to be the same one. Therefore in a similar move to what we did in the manner questions, we can raise the type of the quantified object to sets of events. For example, we can represent (17) as (18).

(17) Jane hit John because he called her names and he kicked her.

(18) $\{p \mid \exists E. \exists e. e = \langle \text{slapping, John, Jane} \rangle \wedge \text{CAUSE}(E, e) \wedge p = \wedge \text{CAUSE}(E, e') \}$

The big E is a set of events. Thus we have a revised version of the semantics of causal “why” questions. Now possible answers would look like:

(19) { that Jane hit John because he called her names and he hit her;
that Jane hit John because he kicked her;
that Jane hit John because he kicked her, slapped her and called her names; ... }

This is in line with the common view that the propositional content of the question is presupposed, i.e. the effect is presupposed to be unique. No answer conjoining is allowed then. In the true answer set there is only one proposition. Thus the Event Singularity Presupposition in Chapter 5 would be equally applicable to “why” questions.

Now that we have a semantics of “why” questions, we can explain the following two phenomena, which are parallel to “how” questions.

First, the exhaustivity marker “all” is not compatible with “why”. For example:

- (20) What all did you buy?
- (21) *Why all did John hit Jane?
- (22) *Which all did you see?

The reason is that there is only one presupposed proposition, thus conflicting with the use of “all” which does not assume uniqueness.

The second phenomenon is that in embedded “why” questions, there is no quantificational variability. For example:

- (23) John mostly knows what they serve for breakfast at Tiffany’s.
- (24) ?? John mostly knows why Bill fixed the car.
- (25) ?? John knows, for the most part, why Bill fixed the car.
- (26) ?? John partly knows why Bill fixed the car.

This is exactly like the situation in embedded “how” questions. The explanation lies in the fact that there is only one true proposition in the Karttunen set, and therefore it is impossible to quantify over different numbers of propositions in the set.

In this section, I extended the analysis of manner “how” questions to “why” questions, and showed that the semantics of these two types of questions are very similar and they behave similarly with respect to the exhaustivity marker “all” and quantificational variability.

7.2 Focus in “Why” Questions

It has long been noticed that different focuses in the same “why” question give rise to different answers. For example:

(27) Why did **John_F** go to see Sally?

(28) Because only he was free at that time.

(29) Why did John go to see **Sally_F**?

(30) Because Sally is his best friend.

If the focus is on “John”, then only the answer in (28) is felicitous; if the focus is on “Sally” then only the answer in (30) is felicitous.

In Mandarin, *weishenme* (“why”) is an adverb. It can occur only to the left of the main verb, sometimes between the subject and the verb, and sometimes in front of the subject. The distinction is that if it appears in front of the subject, then the subject is focused; if it appears after the subject, normally it is not the subject that is focused. For example:

(31) Yuehan weishenme da-le Jieke?

John why hit-PRF Jack?

Why did John hit Jack?

- (32) Weishenme Yuehan da-le Jieke?
Why John hit-PRF Jack?
Why did [**John**]_F hit Jack?

The position of the adverb *weishenme* marks the focus in (32), and therefore there is no need of a special accent or stress on the subject noun. By contrast, in English the accent is needed for the contrast. What examples (31) and (32) show is that the position of the question adverb influences the focus property of the subject, and hence it also influences the meaning of the question. The issue now is how to account for such syntactic marking of the focus in “why” questions. I will leave this topic for future research.

7.3 Summaries

This chapter makes some remarks on the semantics of “why” questions. I point out that the causal “why” questions are essentially the same as manner “how” questions. They share similar properties in terms of their denotation and interpretation. I also point out the focus sensitive nature of “why” questions, and note that the position of *weishenme* in Mandarin may mark the focused NP. “Why” questions are among the most complex and difficult types of questions to deal with. It would be a major theoretical breakthrough if a comprehensive semantic analysis of “why” questions is available.

CHAPTER 8

CONCLUSIONS

In this dissertation, I have looked at wh-argument and wh-adjunct questions in Mandarin. The existential and universal readings of wh-indefinites in Mandarin have also been studied in detail. In the exploration of semantic issues, the phonology-semantics interface, in terms of focus interpretation and scope marking in wh-questions, and the semantics-syntax interface, in terms of the parallel derivation of meaning, both play a very important role. I have shown that the interpretation of wh-questions in Mandarin involves syntax, phonology and semantics. Previous studies on Mandarin questions have not paid much attention to the combination of these three different components of grammar. I think the study of these interface properties should be very promising in discovering new data and new theory.

I have tried to do two things throughout these chapters. Firstly, I want to give new explanations to old data. For example, to move or not to move, that's a very old problem. I have shown that the Alternative Semantics is actually what is needed to bolster the argument for an in-situ analysis of wh-questions in Mandarin. Also the *mei...dou* construction has been a particular source of debate among linguists. I have shown that if it is regarded as a universal concord, many issues will just go away very naturally. In the discussion of "how" questions, I combined event semantics with the semantics of questions, and it proves to be quite interesting. Secondly, I want to see what theoretical contributions are possible. For example, in the comparison of the three theories of questions, I propose that Mandarin wh-questions might embody the most economical design according to Tsai's (1999) Lexical Courtesy Hypothesis. I have also argued that there is no wh-binder in Mandarin, and this shows more support for the compositional semantics in the Alternative Semantics theory. In terms of the

typological implications, I proposed a classification of languages according to the way they use their wh-pronouns and mark the scope of wh-questions, e.g. as shown in Table 2.15 in Chapter 2. In the discussion of manner “how” questions, I gave a semantic representation of the denotation of such questions, which is a first attempt in this direction in the literature. As for the verbal “how” questions, their semantics can shed light on the “*what*” type predicative questions in English.

However there are many issues that I was not able to cover. The first issue is why some wh-words do not have certain readings, while some wh-words have a full array of interpretational variability, as shown in Table 2.2 in Chapter 2. If the Alternative Semantics theory can explain why there are such asymmetries between wh-arguments and wh-adjuncts, it would be further evidence for the applicability of this new theory. Shimoyama (2001, 2006) and Kratzer (2004) did not deal with wh-adjuncts as indefinites. Since wh-adjuncts in Mandarin do show some degree of quantificational variability, it is possible that at least some of these wh-adjuncts can be treated similarly as wh-arguments and their differences would arise elsewhere. For example, the manner *zenme(yang)* can be interpreted as either interrogative or free-choice. Then how does this quantificational variability arise? In contrast, *weishenme* does not show quantificational variability at all. It can only be interpreted as a question. Therefore it seems that *weishenme* is not actually a wh-indefinite. It is inherently different from other wh-pronouns. Tsai (2008) studies the difference between causal “why” and purpose “why”. One property of the causal “why” is that it is generated in CP. In the Tsou language (Austronesian, Taiwan) that he studied, causal “why” is usually expressed bi-clausally. It means that a “why” question would be in the form of “p, and why”. Thus these syntactic properties might help us understand the special properties of causal “why”. As for the purpose “why”, it behaves more like an argument wh-pronoun, probably because of the wh-pronoun *what* that it contains.

Another issue that I would have liked to deal with is the application of the Alternative Semantics to “how” questions. It seems to me that at least in the verbal “how” questions, it is pretty straightforward to apply the Alternative Semantics. As for the manner “how” questions, I am not very sure.

In this dissertation, I have also looked at other types of questions in Mandarin, i.e. polarity questions, VO-not questions, A-not-A questions, and alternative questions. I extended the Alternative Semantics analysis to these types of questions. I focused mostly on the similarity between these types of questions and wh-questions, but research on their differences might also turn out to be theoretically significant.

There are many sentential particles in Mandarin, but they cannot be embedded. Their semantic or pragmatic contribution is still not clear among linguists. It seems to me that studies in this area would be very promising as well.

With this, I conclude my dissertation. I hope that my efforts have been worthwhile, and that they will open new ways into future research. In the best scenario, hopefully, my efforts would be interesting to linguists in other relevant fields.

APPENDIX

This appendix includes all the pitch tracks for the recordings. I recorded 4 native speakers, and each of them recorded 8 sentences. Thus there are 32 figures of pitch tracks here, arranged in the order of the recordings by the speakers.

Speaker 1 data:

Speaker 1 recorded the following sentences:

S1-1: Mei yeyu-le Lei.

Mei ridicule-PRF Lei

Mei ridiculed Lei.

S1-2 : Mei yeyu-le shei?

Mei ridicule-PRF who

Who did Mei ridicule?

S1-3 : Shei yeyu-le Lei?

Who ridicule-PRF Lei

Who ridiculed Lei?

S1-4: (Haoxiang) Mei yeyu-le shei.

Seem Mei ridicule-PRF who

(It seems that) Mei ridiculed someone.

S1-5: Huang Rong mingbai shei mei lai.

Huang Rong clear who not come

Huang Rong is clear who did not come.

S1-6: Huang Rong mingbai shei mei lai?

Huang Rong clear who not come

Who is person such that Huang Rong is clear that he did not come?

S1-7: Huang Rong mingbai shei na-le shenme.

Huang Rong clear who take-PRF what

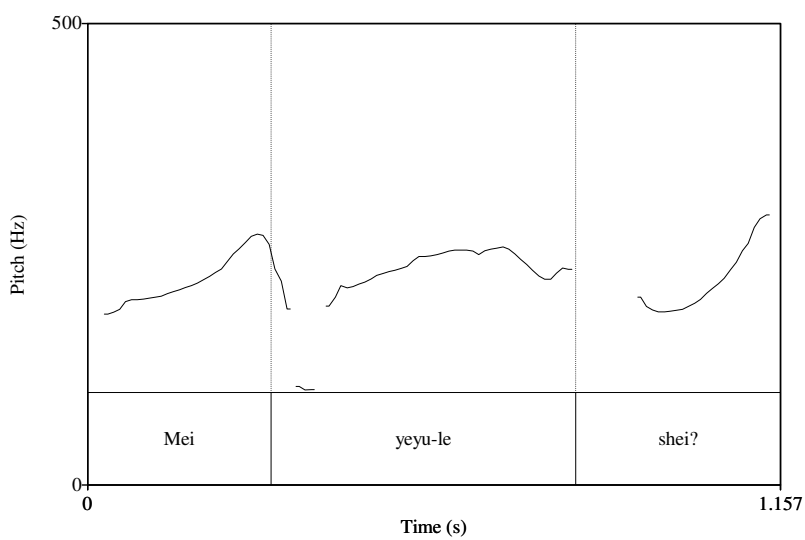
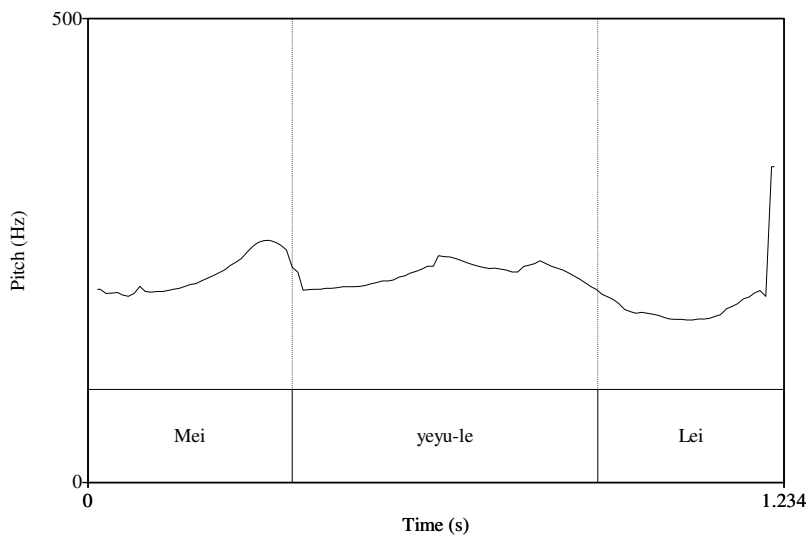
Huang Rong is clear who took what.

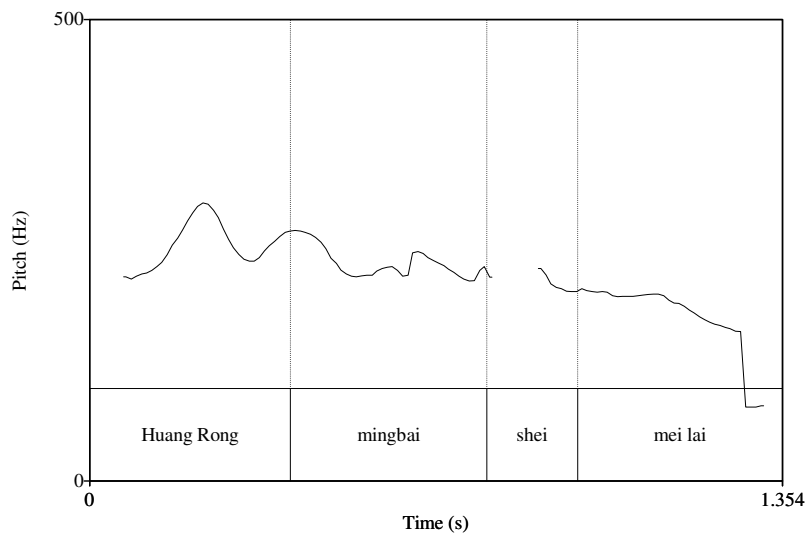
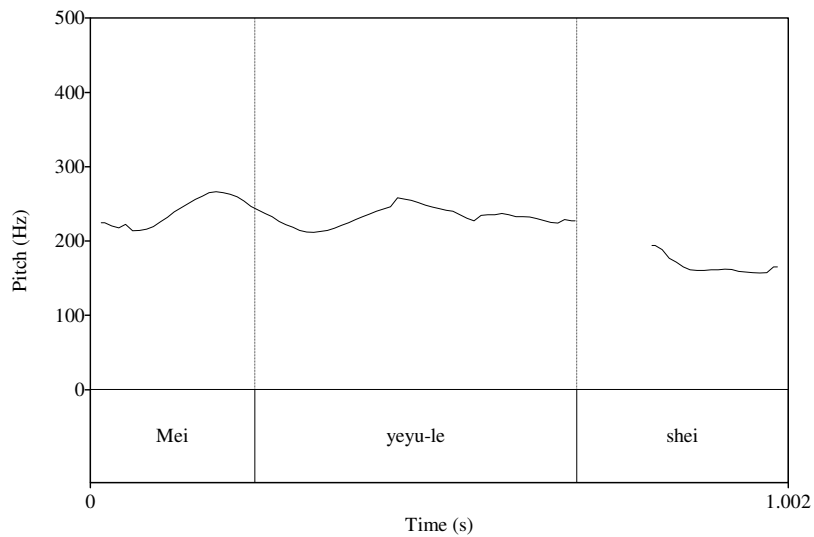
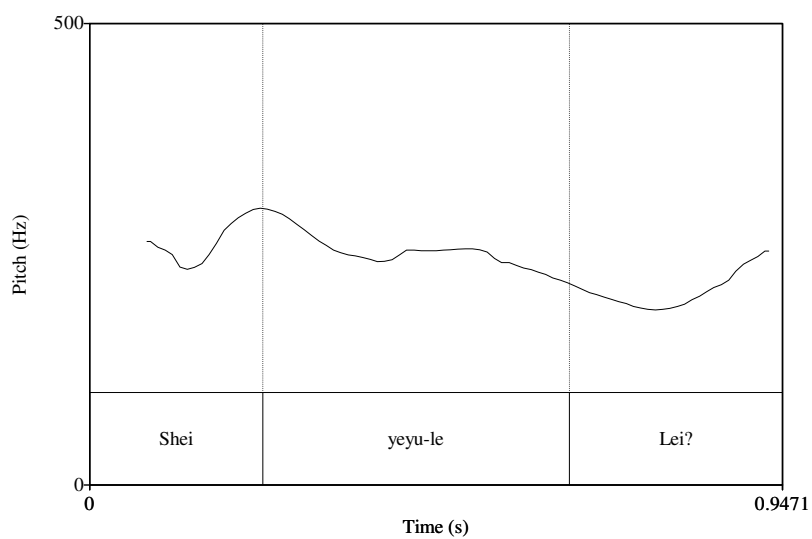
S1-8: Huang Rong mingbai shei na-le shenme?

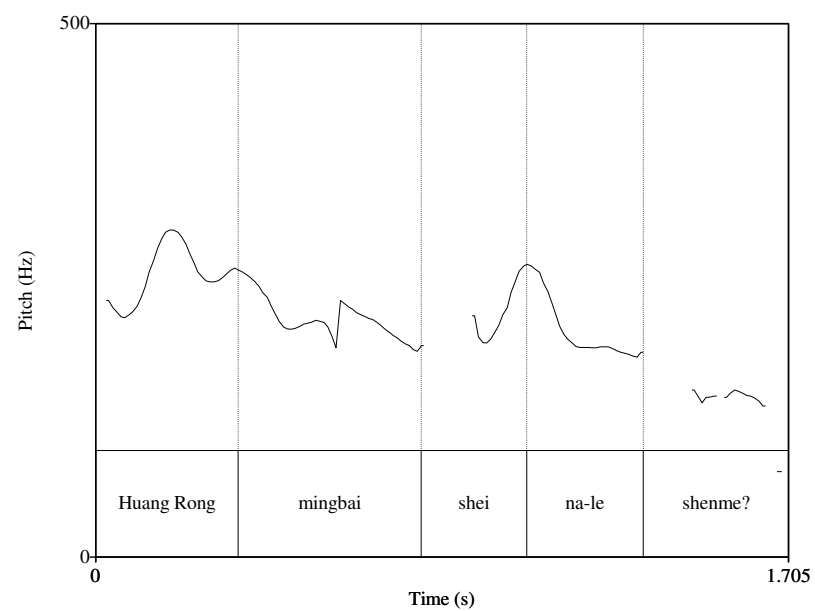
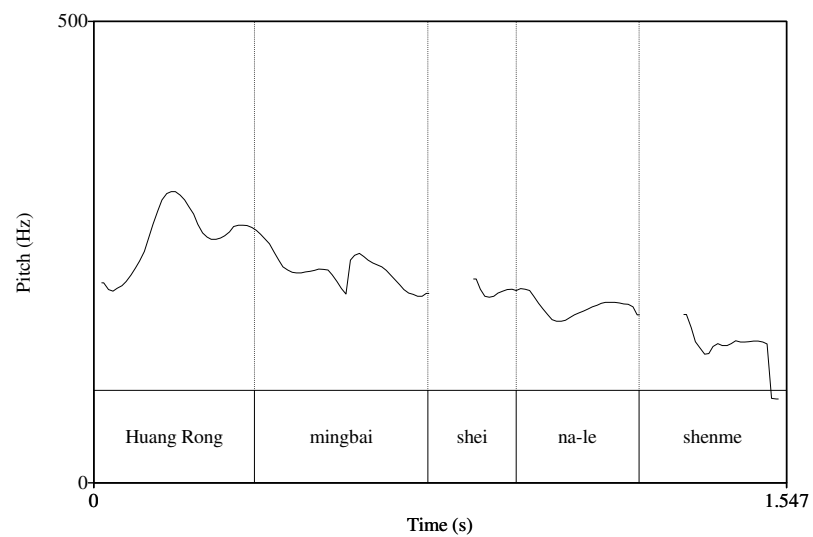
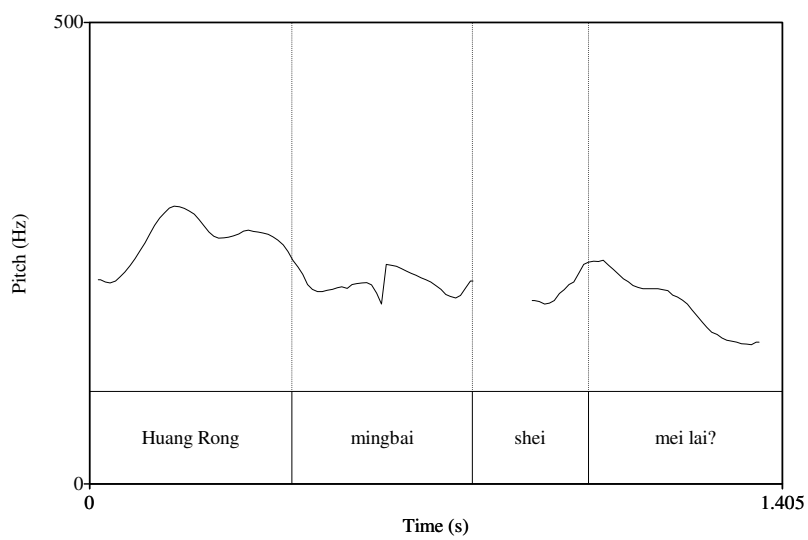
Huang Rong clear who take-PRF what?

Who is such that Huang Rong is clear that he took what?

The pitch tracks for these 8 sentences are:







Speaker 2 data:

Speaker 2 recorded the following sentences:

S2-1: Pei huaiyi Wei.

Pei suspect Wei

Pei suspects Wei.

S2-2 : Pei huaiyi shei?

Pei suspect who

Who does Pei suspect?

S2-3 : Shei huaiyi Wei?

Who suspect Wei

Who suspects Wei?

S2-4: (Haoxiang) Pei huaiyi shei.

Seem Pei suspect who

(It seems that) Pei suspects someone.

S2-5: Bai Ling mingbai shei mei lai.

Bai Ling clear who not come

Bai Ling is clear who did not come.

S2-6: Bai Ling mingbai shei mei lai?

Bai Ling clear who not come

Who is person such that Bai Ling is clear that he did not come?

S2-7: Bai Ling mingbai shei na-le shenme.

Bai Ling clear who take-PRF what

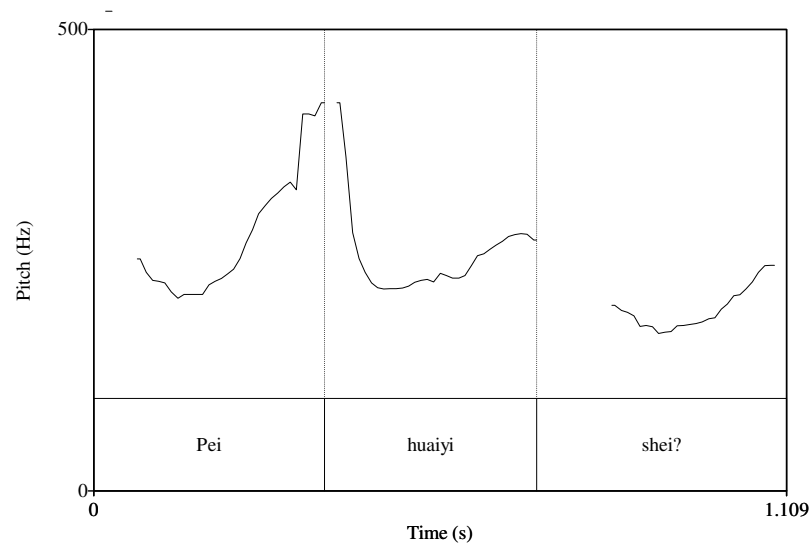
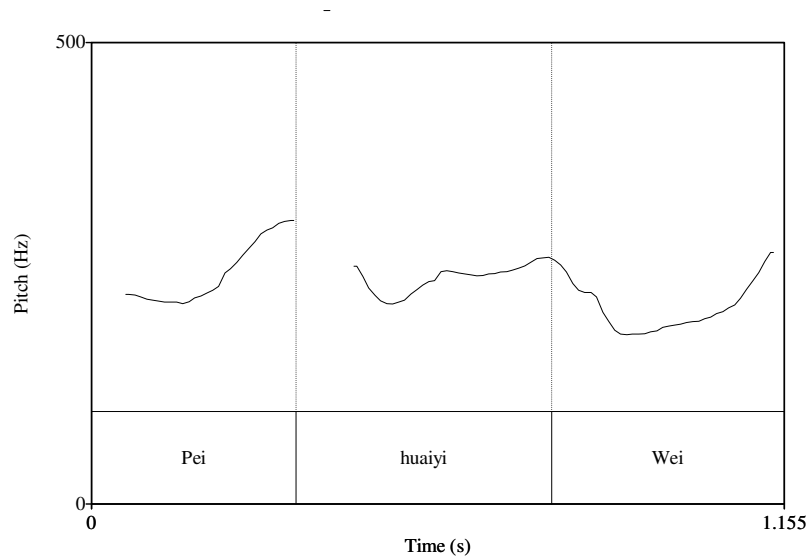
Bai Ling is clear who took what.

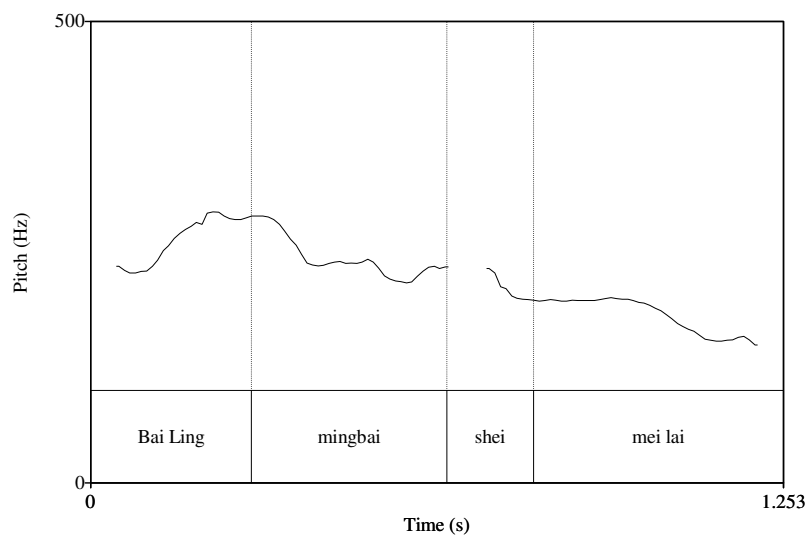
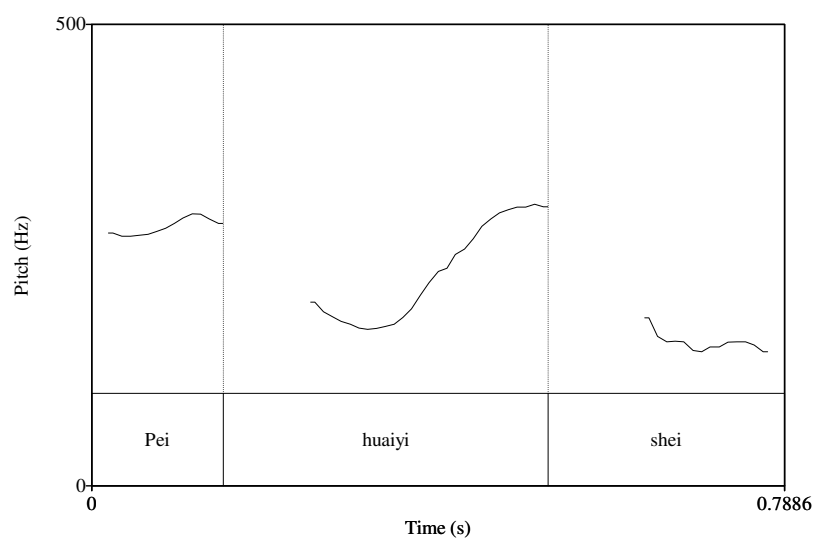
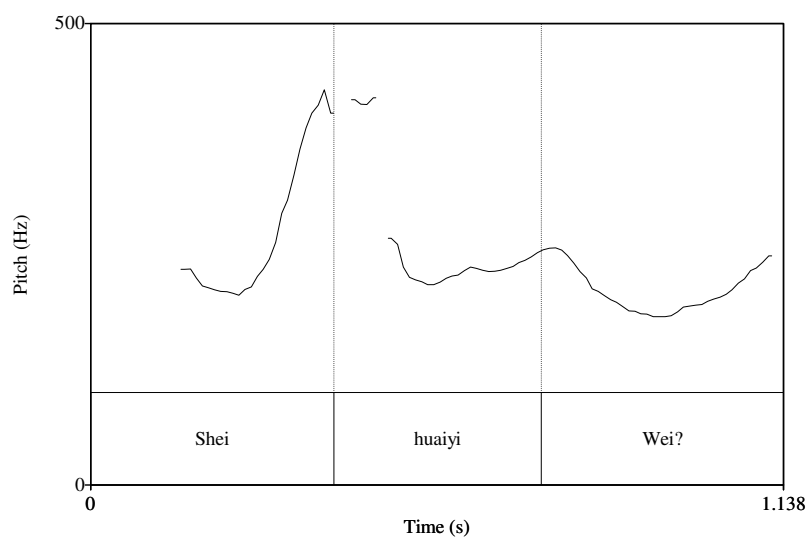
S2-8: Bai Ling mingbai shei na-le shenme?

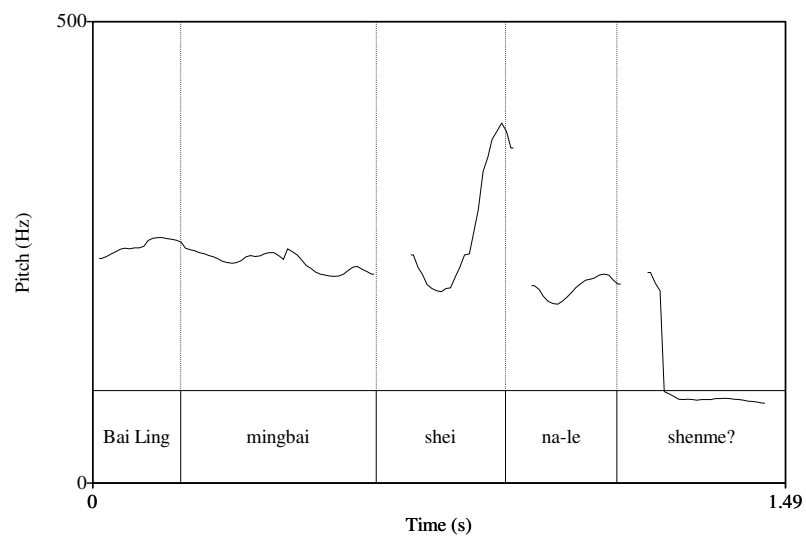
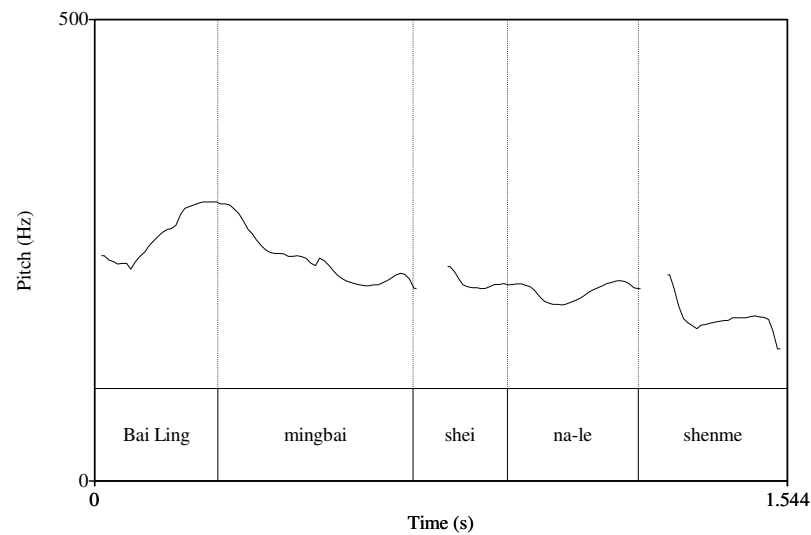
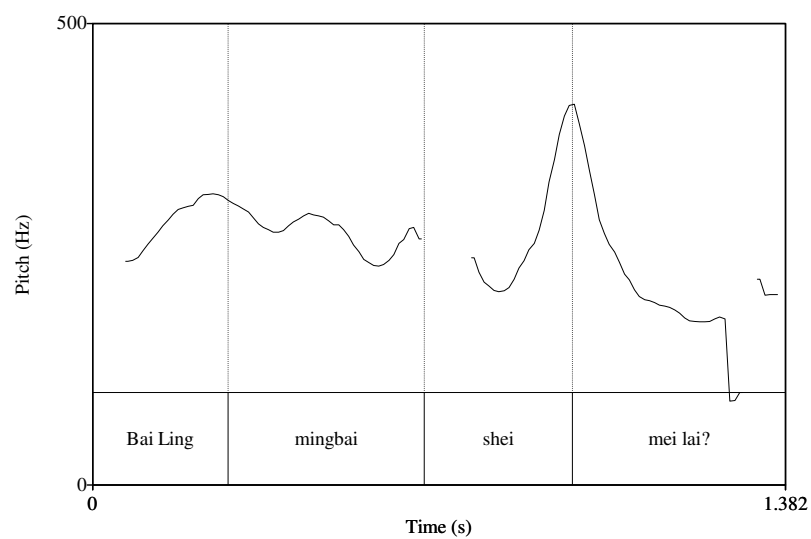
Bai Ling clear who take-PRF what?

Who is such that Bai Ling is clear that he took what?

The pitch tracks for these 8 sentences are:







Speaker 3 data:

Speaker 3 recorded the following sentences:

S3-1: Fei tanhe-le Hui.

Fei impeach-PRF Hui

Fei impeached Hui.

S3-2 : Fei tanhe-le shei?

Fei impeach-PRF who

Who did Fei impeach?

S3-3 : Shei tanhe-le Hui?

Who impeach-PRF Hui

Who impeached Hui?

S3-4: (Haoxiang) Fei tanhe-le shei.

Seem Fei impeach-PRF who

(It seems that) Fei impeached someone.

S3-5: Yan Hui mingbai shei mei lai.

Yan Hui clear who not come

Yan Hui is clear who did not come.

S3-6: Yan Hui mingbai shei mei lai?

Yan Hui clear who not come

Who is person such that Yan Hui is clear that he did not come?

S3-7: Yan Hui mingbai shei na-le shenme.

Yan Hui clear who take-PRF what

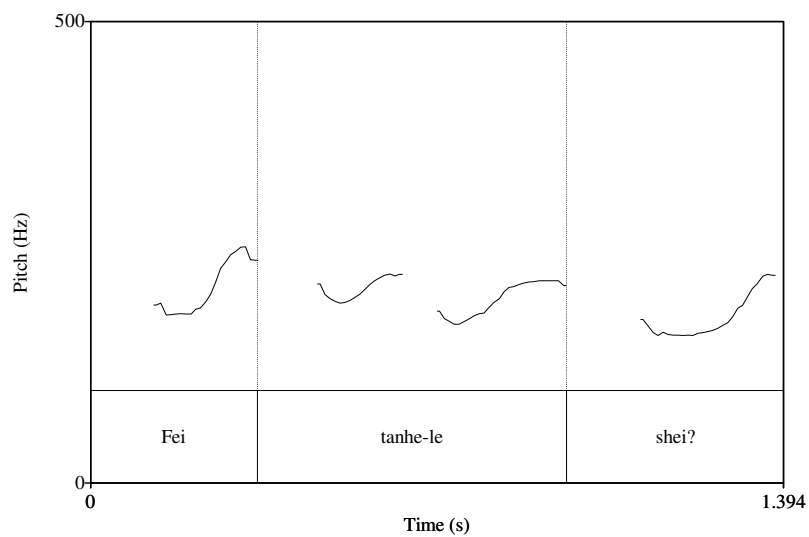
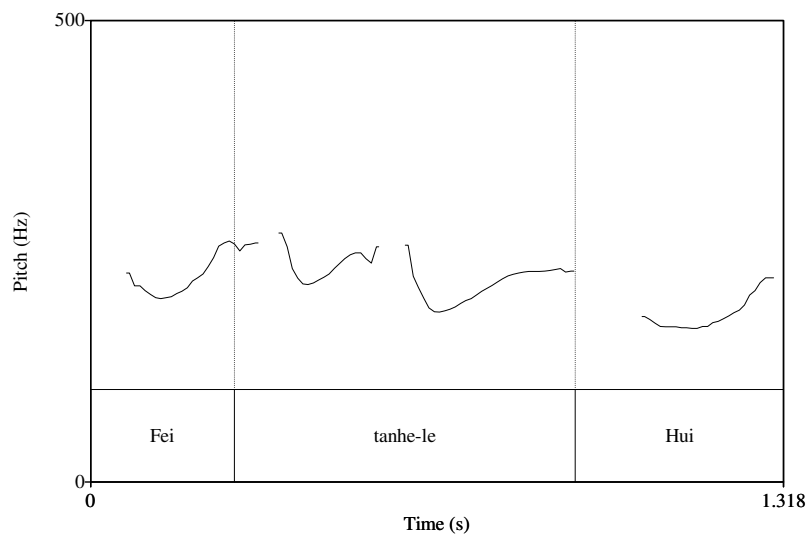
Yan Hui is clear who took what.

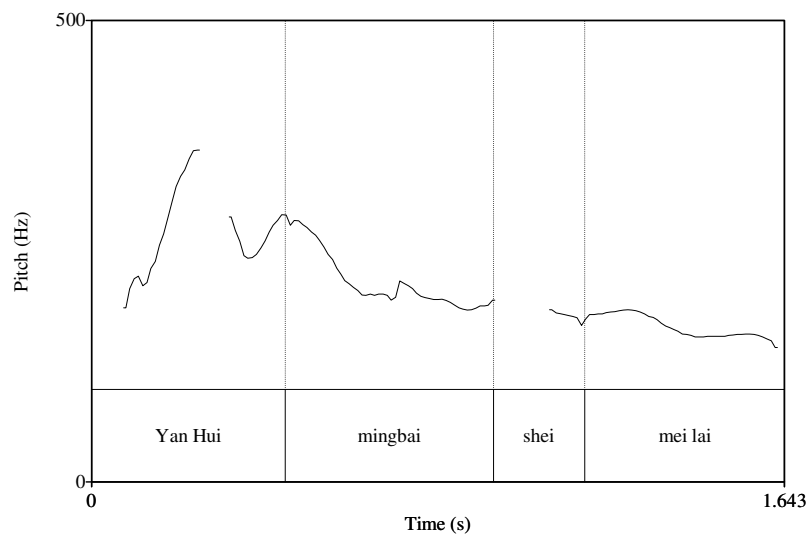
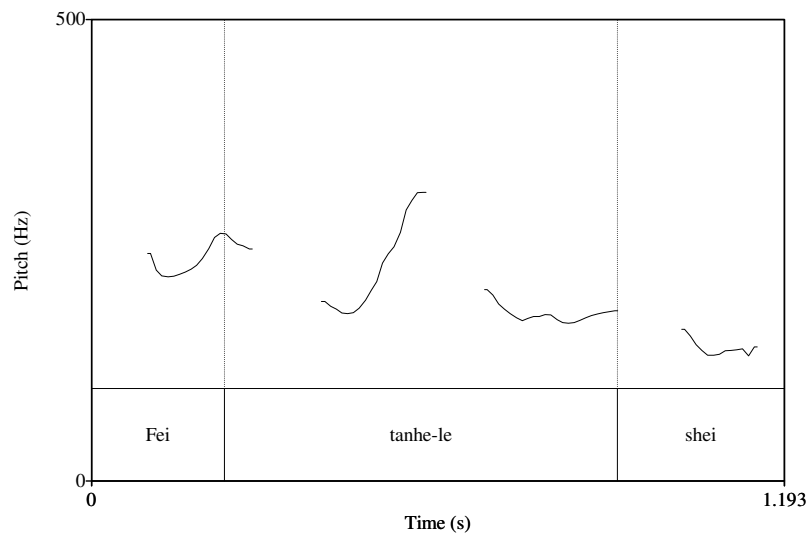
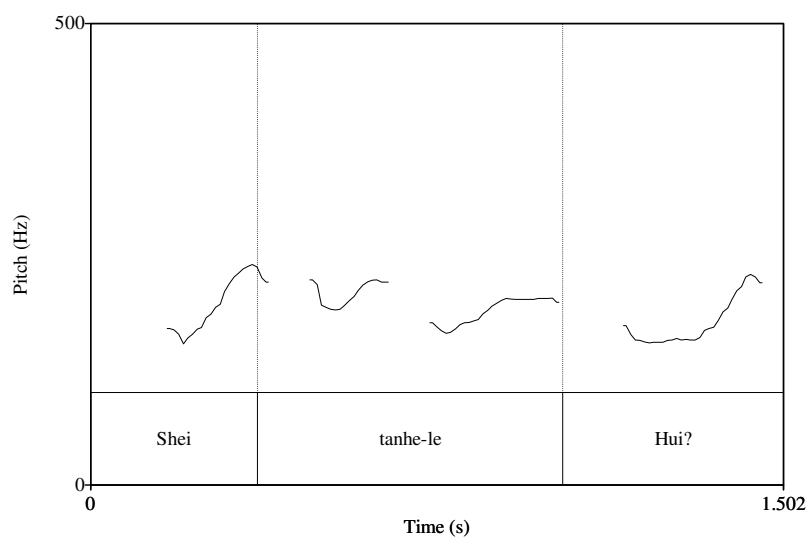
S3-8: Yan Hui mingbai shei na-le shenme?

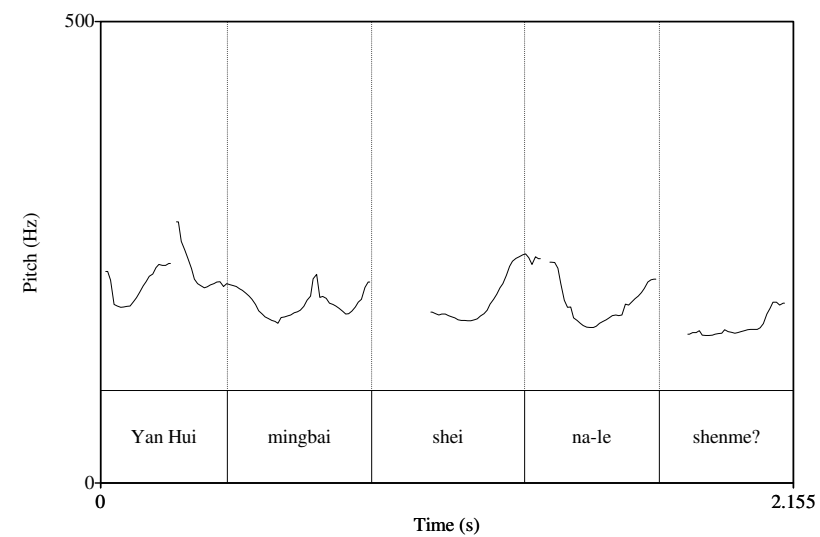
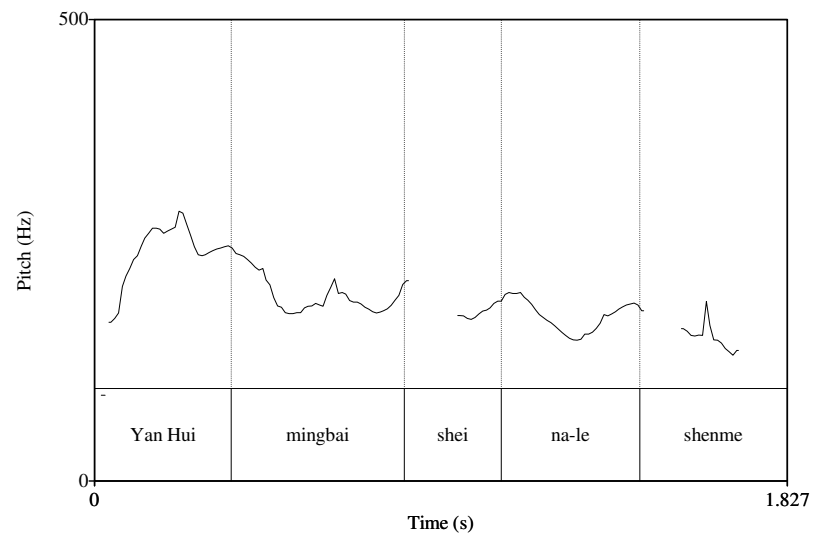
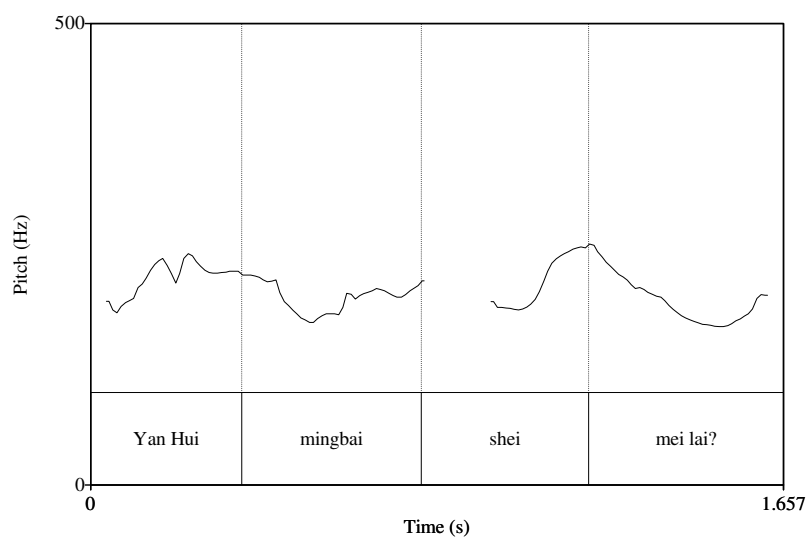
Yan Hui clear who take-PRF what?

Who is such that Yan Hui is clear that he took what?

The pitch tracks for these 8 sentences are:







Speaker 4 data:

Speaker 4 recorded the following sentences:

S4-1: Sui pancha-le Kui.

Sui interrogate-PRF Kui

Sui interrogated Kui.

S4-2 : Sui pancha-le shei?

Sui interrogate-PRF who

Who did Sui interrogate?

S4-3 : Shei pancha-le Kui?

Who interrogate-PRF Kui

Who interrogated Kui?

S4-4: (Haoxiang) Sui pancha-le shei.

Seem Sui interrogate-PRF who

(It seems that) Sui interrogated someone.

S4-5: Yao Ming mingbai shei mei lai.

Yao Ming clear who not come

Yao Ming is clear who did not come.

S4-6: Yao Ming mingbai shei mei lai?

Yao Ming clear who not come

Who is person such that Yao Ming is clear that he did not come?

S4-7: Yao Ming mingbai shei na-le shenme.

Yao Ming clear who take-PRF what

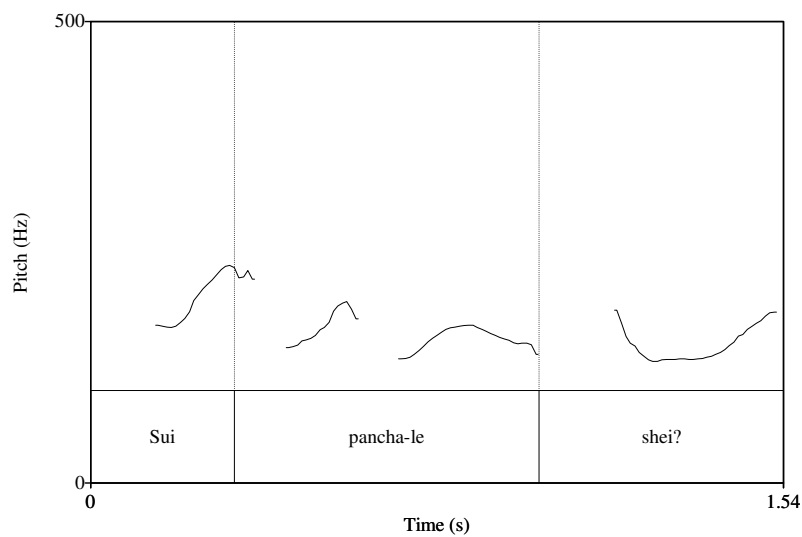
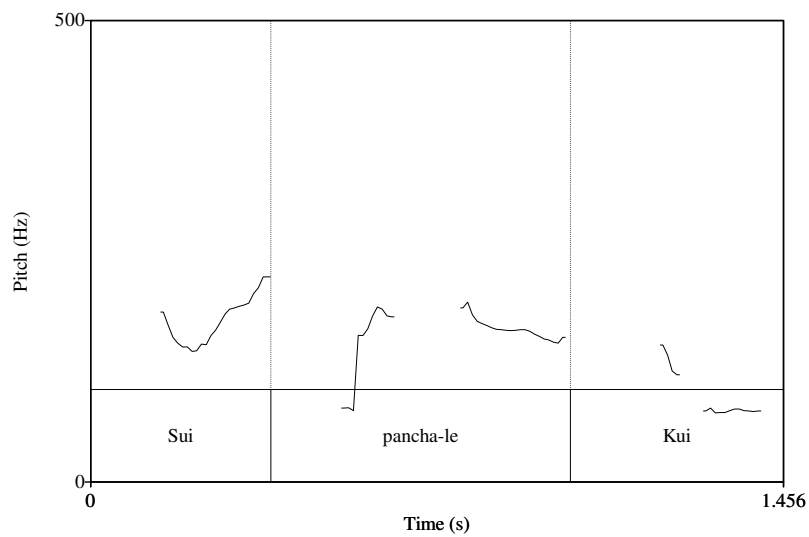
Yao Ming is clear who took what.

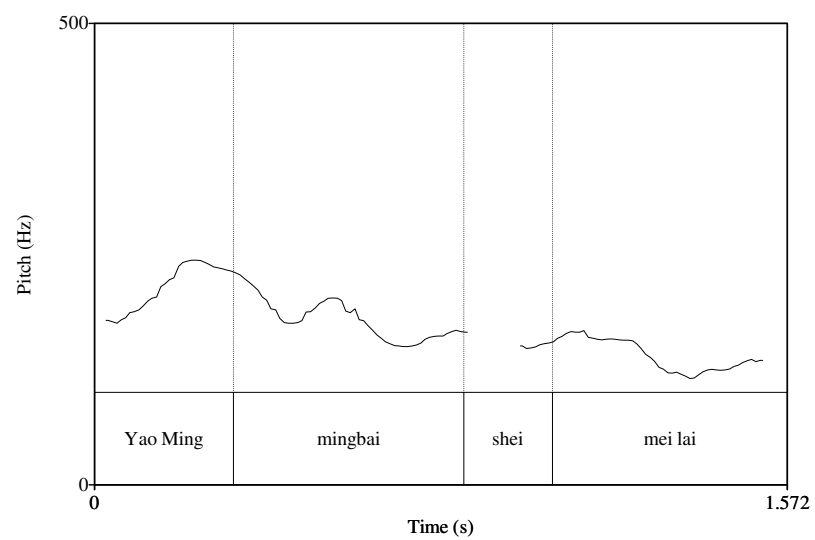
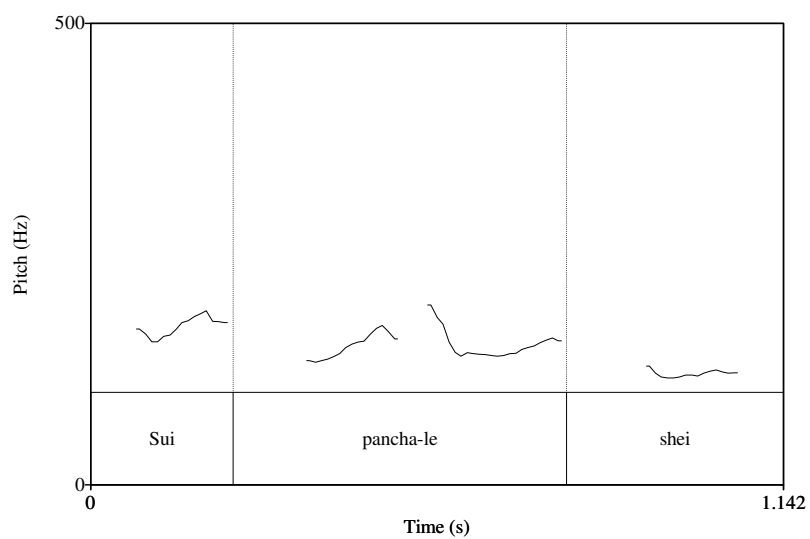
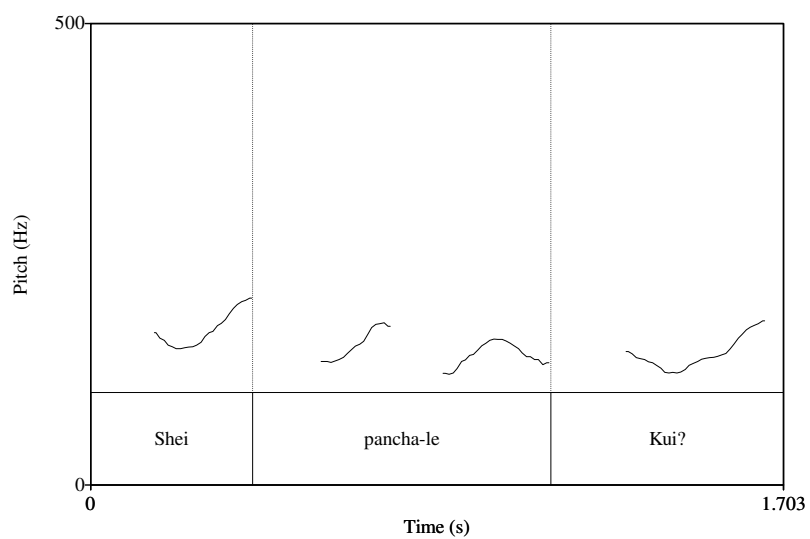
S4-8: Yao Ming mingbai shei na-le shenme?

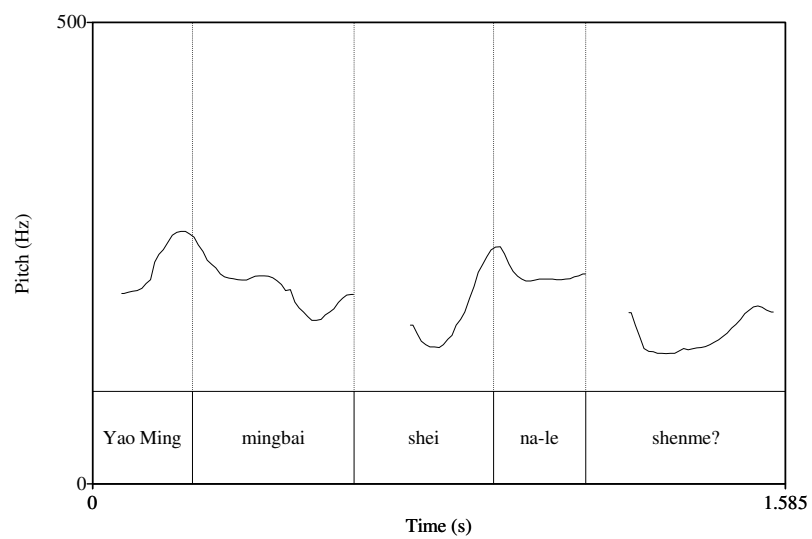
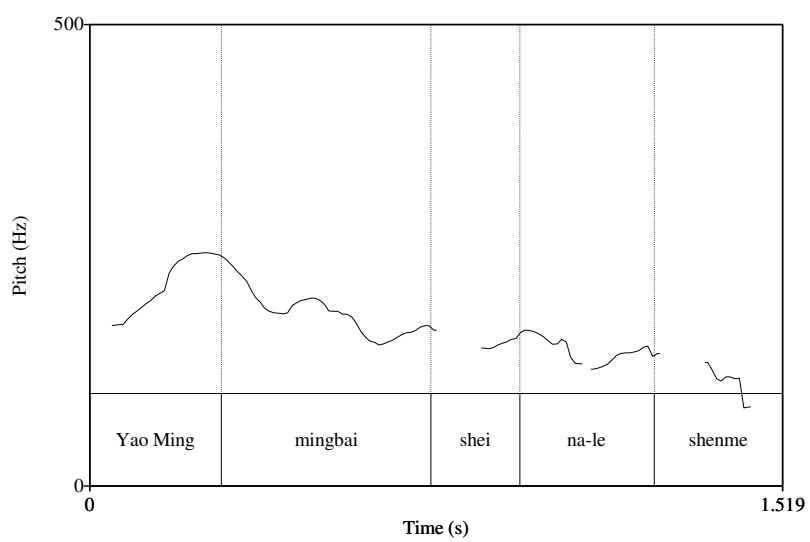
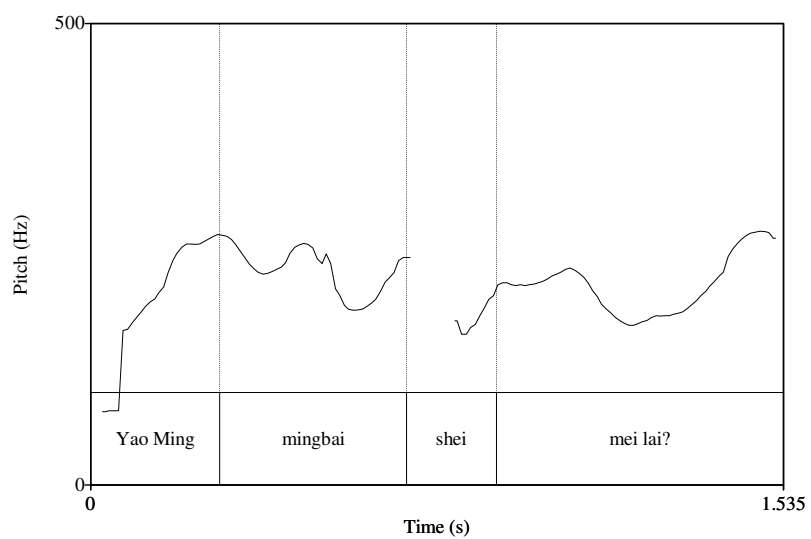
Yao Ming clear who take-PRF what?

Who is such that Yao Ming is clear that he took what?

The pitch tracks for these 8 sentences are:







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